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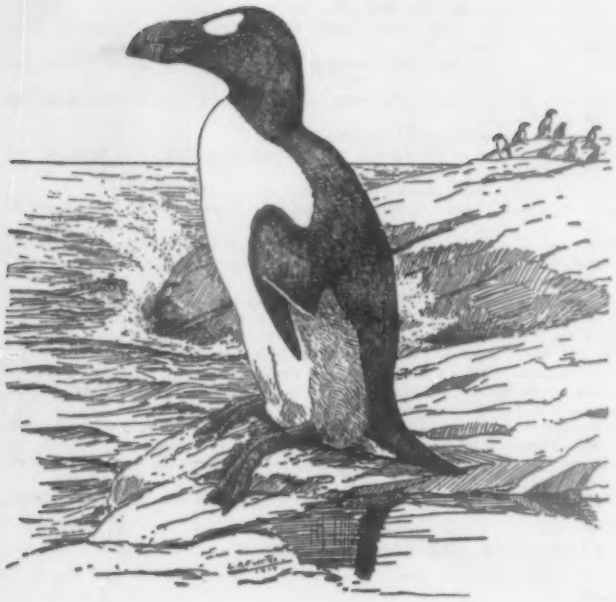

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Flesh-footed Shearwater—feeding young. (Photo by J. Warham)

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THE NESTING OF THE SHEARWATER *PUFFINUS CARNEIPES*

BY JOHN WARHAM

THE Flesh-footed (or Fleshy-footed) Shearwater (*Puffinus carneipes*) is a pelagic bird breeding in south temperate latitudes on islands off southern Australia and off New Zealand and ranging north across the Equator, sometimes to the Pacific coast of North America. It is designated "Pale-footed Shearwater" in the A.O.U. Check-list, but I use the name by which it is generally known where it breeds.

APPEARANCE

The Flesh-footed Shearwater is a large and powerful petrel, about 18 inches long and weighing some 20 ounces. It is clad in brownish-black plumage and has a fan-shaped tail, a pale beak, and pale, flesh-colored legs. Superficially the bird resembles the dark phase of the more widespread Wedge-tailed Shearwater (*P. pacificus*), but that species has a smaller, darker beak, leaden-gray in color, while the tail is longer and truly wedge-shaped, not slightly rounded as in *carneipes*. These differences make the two species separable in the field, contrary to Alexander's suggestion (1945) that they "can hardly be distinguished in life". There is also some resemblance in color to the Sooty Shearwater (*P. griseus*) and the Short-tailed (Slender-billed) Shearwater (*P. tenuirostris*); but both these species have dark bills and grayish legs, and *griseus* has whitish under-wing coverts, while *tenuirostris* is distinctly smaller, with a shorter tail.

DISTRIBUTION

The known breeding grounds of the Flesh-footed Shearwater are widely separated, with a gap of over two thousand miles. The western population breeds on islands off the southwest coast of Australia; the eastern population on Lord Howe Island east of Australia and on islands around northern New Zealand. Campbell (1900) found a few eggs on the

mainland of southwestern Australia opposite Mutton Bird Island, Torbay; but C. Allen tells me (*in litt.*) that they last nested there in 1937, since when, because of depredation by foxes, breeding there has been discontinued.

Two races may be recognizable, *P. carneipes carneipes* Gould of Western Australia (from Cape Leeuwin to the Recherche Archipelago, 700 miles to the east), and *P. carneipes hullianus* Mathews from Lord Howe Island and New Zealand (Hindwood, 1945).

Although no banded birds have yet been recovered, the many records of Flesh-footed Shearwaters from the north Pacific show that this is a trans-equatorial migrant to Japanese and North American waters. Summarizing records of the species for North America, Duvall (1945) suggests that "it perhaps is fairly regular in occurrence off the Pacific coast of the United States and Canada".

There are at least two records of the bird from Ceylon, and one of these, picked up in June 1944 on the beach near Mt. Lavinia, is stated to belong to the Western Australian race (Hill and Burn, 1944). There is as yet no evidence that this race reaches the Pacific Ocean. Gibson-Hill (1953) suggests that the west Australian birds on leaving their breeding grounds "move westward round Cape Leeuwin, making for the waters south of Houtman's Abrohlos. Thence they strike out diagonally across the southern part of the Indian Ocean, finishing up somewhere in the broad patch of open sea north of the Mascarene Islands. Here they pick up the monsoon in June, and are carried round with it in a broad sweep, first northwards, past the Seychelles, then eastwards between the Maldives and Laccadives, past the southwest coast of Ceylon, and so down again towards Australia, skirting the Fremantle coast, southward bound, in October".

Serventy (1953) has pointed out that specimens of *P. carneipes* have been taken off California during the February to September period as well as later in the year, thereby paralleling the occurrence in that area of the South American breeding Sooty Shearwater (*P. griseus*), rather than that of the New Zealand *P. bulleri* and the Australian *P. tenuirostris*, which breed during the same period as do the known populations of *P. carneipes*, but occur off California from October to February. Serventy suggests that there may possibly be an as yet unknown breeding place of *carneipes* somewhere in southern South America, with a regime more like that of *griseus*.

According to Serventy and Whittell (1951) the foraging range during the breeding season, the southern summer, is extensive. Serventy (*in litt.*) tells me that a shearwater taken off Amsterdam Island in the Indian Ocean on January 3, 1952 (Paulian, 1953) ascribed to *P. pacificus*,

proved, when examined by Serventy in 1955 at the Museum d'Histoire Naturelle in Paris, to be a specimen of *P. carneipes*. This individual was almost three thousand miles from the nearest known breeding grounds, and of course could be a non-breeding bird.

TIME AND SITE OF STUDY

The present observations were made during a visit with my wife to Eclipse Island from January 26 to February 11, 1956. Eclipse Island, a manned lighthouse off the south coast of Western Australia, lies at approximately 35° 10′ S., 117° 55′ E. and has a planar area of about 400 acres. The coastline is entirely rocky and there are no beaches. Much of the level ground is bushy. A description of the island and a list of its avifauna have been given elsewhere (Warham, 1955*b*). Apart from man, the introduced rabbit, and the Hair Seal it supports no resident mammals.

In addition to *P. carneipes*, which breeds during the southern hemisphere summer, Eclipse Island has two winter-breeding petrels, the Little Shearwater (*P. assimilis*) and the Great-winged Petrel (*Pterodroma macroptera*), whose habits there had been studied during previous visits (Warham, 1955a, 1956). Both these birds were present in some numbers during this 1956 summer visit, and towards the end of our stay, in February, all three species might be heard calling on the wing or on the ground at the same time. The breeding season of the Flesh-footed Shearwater on Eclipse Island seems to coincide roughly with that of the New Zealand population (Falla, 1934); on the other hand the non-migratory Great-winged Petrels breed about two months earlier than their fellows in northern New Zealand (Warham, 1956).

Our visit was authorized by the Commonwealth of Australia Marine Branch. We are indebted to the lighthousekeepers and their families for much assistance, to Mr. A. Bentley of Albany for transport, and to Mr. W. McAuliffe for his kindness in checking the progress of marked nests after our departure. I am particularly grateful to Dr. D. L. Serventy of the C. S. I. R. O., Wildlife Survey Section, Perth, for reading the manuscript, suggesting a number of improvements, and for allowing me to use some hitherto unpublished information on *P. tenuirostris* for comparative purposes.

METHODS

In order to ascertain the attentiveness of the adult birds, six burrows were chosen whose nesting chambers were either under a mat of vegetation or near the surface. These burrows were fitted with false roofs, which could be raised slightly after dark and inspected with a torch.

Each parent and chick was banded with colored and monel metal bands so that individuals could be recognized without handling. Some birds were banded during the day, others at night. In no instance did any bird leave its nest when replaced, although all struggled hard and pecked viciously. These marked nests were checked at least once nightly around 21:00 hours and again the following morning. A ring of short sticks placed at the entrance was found useful as an additional check on whether the chick had received a visit during the night. There was no time to undertake an extensive banding program and only 100 birds, all but 5 being adults, were marked with numbered monel metal rings inscribed "Write Wildlife, C. S. I. R. O. Canberra, Australia".

In three instances adults vomited food while being handled. This food consisted of slivers of small fish about 2 inches long; no cephalopod beaks were noted.

In order to study the behavior of birds within the nesting chamber a blind was set up on top of a suitable nest so that after dark the false roof could be removed and the birds' actions observed with the aid of a red light. This method, found successful during previous work with the Manx Shearwater (*P. puffinus*) on Skomer Island, West Wales, and with the Little Shearwater (*P. assimilis*) on Eclipse Island, proved to be feasible also with the Flesh-footed Shearwater. Electronic flash photography was used to record the arrival of the adult at the nest and its feeding of the chick. As had been my experience with other shearwaters, the flashes were ignored by the Flesh-footed birds and although the slight noise of discharge made them pause momentarily they did not break off their current activity.

Flight and Locomotion about the Nesting Area

Flesh-footed Shearwaters were never seen flying over the island by day. At night the incoming birds flew fast—their wings are long and thin (Plate 2). Like other members of their genus with which I am familiar, most birds made several circuits of the nesting area before settling and often took two or three runs up to the alighting point before their final touch-down. When coming in to land the birds swept into the wind with spread webs acting as brakes, and when a yard or so above the ground they suddenly raised their wings, stalled and dropped to the ground with a thud (Plate 2). Occasionally they remained where they fell, but more often some momentum was retained and they ran forward for a few yards before resting. It was clear that most individuals were well orientated on landing, as it was common to see a bird alight and immediately run straight to a burrow into which it would disappear without hesitation (Plate 3). Nor were they reluctant to land among

Flesh-footed Shearwater. (*Above*) Night flight above breeding ground. (*Below*) About to alight. Photos. by J. Warham.

trees, as the Greater Shearwater (*P. gravis*) apparently is (Rowan, 1952); in fact, nests were most plentiful beneath scrubby tea-trees (*Leptospermum*) which grow to about 30 feet. The Flesh-footed Shearwater did not usually crash land into these as the Little Shearwaters often did. Instead they alighted in clear spaces between the trees or along the island paths where these cut across the Tea-tree belts. Certain spots were favored landing grounds and by sitting quietly there after dark we could watch the birds alighting and rapidly dispersing to their burrows.

The first Flesh-footed Shearwaters would arrive about 30 minutes after sunset, their numbers building up very quickly thereafter. These early birds, which I suspect were mostly nesters rather than unemployed birds—that is, birds without eggs or chicks (Richdale, 1944)—were silent. Watching was mainly done while there was still enough light to see the birds' movements (many nights were fairly light with the moon obscured by cloud). Calling did not seem to increase greatly on the few really dark nights we had and we saw no evidence that flying birds are guided to their burrows by the calls of their mates, as Glauert (1946) suggested. If, as seems probable, Flesh-footed Shearwaters do not breed until they are 5 or more years old, in line with recent findings for the smaller Short-tailed Shearwater, *P. tenuirostris* (Serventy, 1956) and the Fulmar, *Fulmarus glacialis* (Fisher and Lockley, 1954), nesting birds may well have several seasons experience of their chosen islands and perhaps of a particular part of that island during their "apprentice" years as unemployed birds. If so they would develop a knowledge of the topography of the area which would be invaluable in their later years as breeding birds. This possibility is reinforced by D. L. Serventy's findings with *P. tenuirostris* on Fisher Island, Bass Strait, where young birds begin to appear on the island at 3 years old and non-breeding birds of 5, 6 or 7 years of age are found repeatedly in the same general area.

Our stay coincided with a period of waning moon and it had been hoped that this might enable the effect of moonlight on the birds' activities to be gauged. However, heavy clouds made the nights much darker than they would otherwise have been; on the only night when the moon was bright there was a noticeable diminution in aerial activity and song on the part of the shearwaters although the moon seemed not to affect the attentiveness of the birds at the study nests at several of which reliefs were made and food dispensed.

Flesh-footed Shearwaters are not as ungainly on the ground as are Little Shearwaters and Manx Shearwaters. They can run quickly with a fairly upright carriage and do not wave their wings about as much as many shearwaters do; their light colored legs glint in a torchlight as they

scuttle off when disturbed. The legs seem to be placed further forward in this species than in *P. puffinus* or *P. assimilis*, and this may account for their better performance on the ground.

Eclipse Island is so hilly and winds so frequent that the birds had little difficulty in becoming airborne; indeed, they could fly without any preliminary run; presumably the forward position of their legs increases the effectiveness of their initial leap.

RAFTING

The assembling of shearwaters towards evening on the sea near their island nesting grounds has been noted in several species. It is well known in the Manx Shearwater (Lockley, 1942), and occurs in the Greater Shearwater at the end of the nesting season, apparently as a prelude to migration, (Rowan, 1952). During previous visits to Eclipse Island from July 9 to 24 and September 9 to 24, 1954, when Great-winged Petrels and Little Shearwaters were nesting, no signs of off-shore rafts by these two species could be seen despite repeated sweeps of the sea with the aid of the lighthouse telescope. I had concluded that probably the petrels do not congregate in this way, while reserving judgment on the Little Shearwaters in view of their small size and the difficulty of detecting them on the surface of the presistently choppy winter seas.

I soon found, however, that part at least of the island's Flesh-footed Shearwater population formed into rafts offshore towards evening, although only one such assemblage was seen daily. This raft was always located in approximately the same area no matter what the wind strength or direction; it lay about one mile south of a promontory known as Black Rock. Up to 700 birds were counted here on some evenings but this could only represent a small fraction of the island's breeding birds whose numbers must run into thousands. Presumably there were other rafts further out where they would probably be invisible, particularly in warm weather when heat haze prevents effective use of binoculars or telescopes.

Assembling would begin well before sunset. Thus on February 10 with sunset at 19:10 hours (West Australian Standard Time based on 120° W) a single bird was sighted at 17:00 hours and this had been joined by 20 others by 17:50 hours. By 18:20 this group had grown to 70 birds. Newcomers usually alighted some yards in front of those already settled so that, with an easterly breeze, the flock appeared to be creeping gradually in that direction, each bird facing the wind. By 18:25 some 150 birds were present and at 19:10 a compact flock of 200. Ten minutes later the whole raft was seen to break up and all were glimpsed flying in groups just above the waves. About the same time

the first single and silent birds were circling over the island. The way in which the numbers of shearwaters appearing overland built up so quickly once the influx had begun seemed to be correlated with the dispersal of resting flocks at sea and their convergence upon the island.

In the early evening, when the rafts were beginning to form, it was possible occasionally to glimpse the light webs of the feet as the incoming birds turned in the evening sun, a point which emphasized that the birds were in fact *carneipes* and not *Pterodroma macroptera* which, though similar in size and coloring, have black legs and dark webs.

VOICE

Both Falla (1934) and Hindwood (1945) comment on the Flesh-footed Shearwater's voice. Falla notes that in New Zealand during November the din at night associated with courtship and mating is considerable and that the birds begin to call before alighting, using a "sharp mewing note like that of a kitten". Hindwood, writing of birds flocking to fish offal in the sea at Sydney, New South Wales, notes that they infrequently used a sharp note "not unlike that of a Pomarine Skua (*Stercorarius pomarinus*) but of a higher pitch."

During our stay on Eclipse Island, when hatching was taking place, there was still some calling after dark from birds on the wing and much more from others on the ground. I suspect that by this time the noisiest period had passed since calling is usually greatest among shearwaters before egg-laying, when many unemployed birds visit the breeding grounds. Indeed, on some nights, the Little Shearwaters, which would not have eggs for another five months, were more noisy than their nesting Flesh-footed relatives.

The song of the Flesh-footed Shearwater, given both on the ground and in the air has three phrases: 1. A brief introductory or "warming up" phrase, a series of short "gug, gug, gug's" leading into 2. The main phrase, a trisyllabic asthmatical crooning with the middle syllable stressed, "ku -*kooo* -ah" which is repeated from three to six times in succession and tends to become increasingly hysterical in tone, the "*kooo*" degenerating to a scream towards the end. The first two syllables are given as the breath is expelled, the final sob on the intake. 3. The tailpiece is a splutter rapidly dying away and not unlike the introductory phrase.

As obtains with other shearwaters, sitting birds will sing in daylight from within their nests stimulated by the noise or vibration of footsteps. Courting birds also include in their repertoire a variety of quiet cackling sounds, not unlike those used by a broody hen.

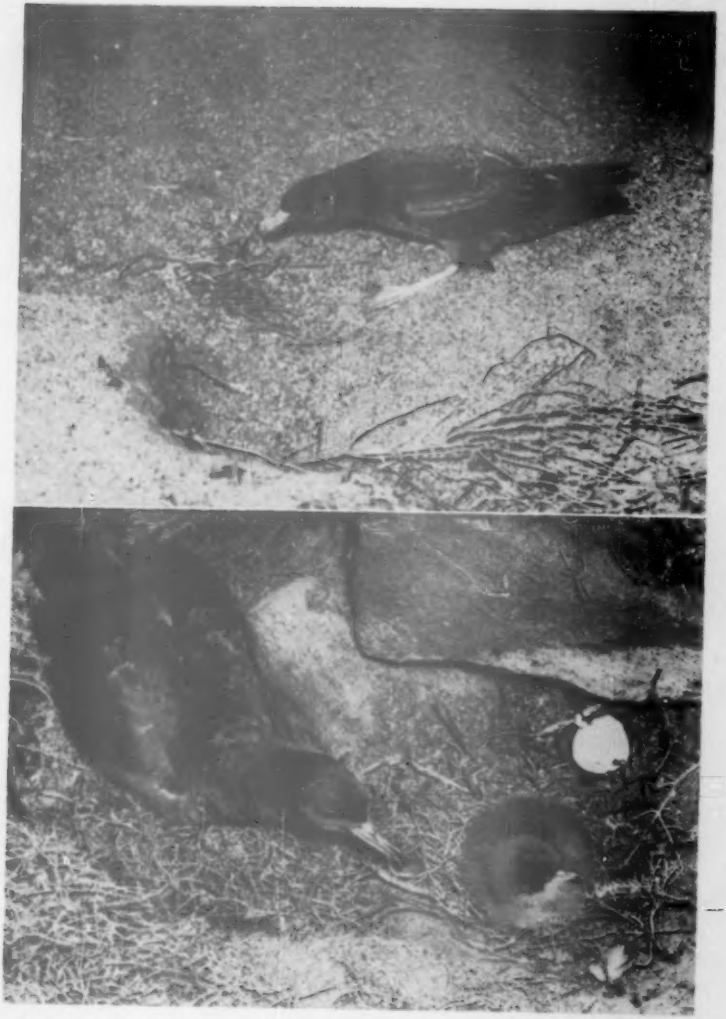
COURTSHIP BEHAVIOR

Although the bulk of the eggs were hatching during our stay in late January and early February, courtship behavior was to be seen both from birds with eggs and from others believed to be non-breeders. The behavior was much like that noted for other members of the genus, and in line with Falla's observations (1934) at New Zealand colonies. Crooning duets in which the participants crouched side by side, heads together and napes arched, were frequent. These were interspersed with bouts of mutual preening when the birds dibbled at each other's heads and necks. This was sometimes done so vigorously that the recipient jumped back as if hurt. Crowing from one pair would often be echoed by others in the area so that for a few minutes the sounds would rise to a *crescendo* only to die away again abruptly. Quite crude imitations of their song would result in a wholehearted response in nearby birds.

THE NEST

Flesh-footed Shearwaters on Eclipse Island are all burrowers; no eggs were seen on the surface nor any in niches among the rocks. Burrows are found wherever the soil is deep enough, from the top of the island at about 350 feet above sea level to within about 40 feet of high tide mark. Presumably because they are so much bigger, few attempts are made at burrowing into the rocky slopes, as the Little Shearwaters do so successfully. The Flesh-footed Shearwaters were concentrated on relatively level ground, particularly beneath the belts of tea-tree where the soil is deep. Such places were honeycombed with burrows. The entrance tunnels vary from 3 to 6 feet in length (average about 4½ feet) sloping down at from 15 to 30 degrees so that the nesting chamber may be as little as 6 inches or as much as 2 feet below the surface depending on the configuration of the ground. Where this was clothed with a mat-like heathery scrub several burrows were found, which were not really underground at all, being merely shallow hollows scooped in the soil and effectively shaded from above by the tightly packed herbage.

The few nesting chambers which could be inspected without destruction of the nest were about 30 inches long by 12 inches wide and 9 inches high. A feature of the nests was the way the mouths of the tunnels in use were clogged with dead grasses and herbage, apparently dragged there by the birds themselves. Daytime checks revealed that those with their entrances blocked in this way were almost always occupied; conversely unblocked burrows were generally empty. The effect of choking the entrances like this was to make the burrows look disused, but the real purpose of the habit might be to cut down the amount of light reach-



Flesh-footed Shearwater. (*Above*) Walking to burrow. (*Below*) Arrival inside nesting chamber. Photos. by J. Warham.

ing the birds within. The herbage would offer little or no barrier to the entrance of marauding skinks. Despite the amount of material jammed in the mouth of the tunnel, the chambers themselves were sparsely furnished with a lining of grasses, dead pigface (*Carpobrotus*) stems, and the like.

Some burrowing was still taking place, the birds pecking with their bills and scratching the spoil out in a dusty stream using their feet one at a time. Some of this activity was doubtless from unemployed birds and some from breeders which were cleaning out tunnels partly clogged by daytime falls of the dry earth.

Incubation and Hatching

The incubation period of the Flesh-footed Shearwater's single egg still seems to be unknown and our visit was too late in the season to ascertain it. According to Serventy and Whittell (1951), the bulk of egg laying in 1943 was found by A. V. Newman to take place during the first week of December. Probably both sexes assist in incubation, but we could not be sure of this point since banded birds either had chicks, chipping eggs or hatched their eggs before changeovers occurred. Incubating shearwaters remained quietly inside their burrows by day and were resentful of interference, striking hard with their sharp bills at anything inserted into the nest and crowing angrily.

At hatching the chick cheeps lustily while smashing its way out of the egg. One nest was found through the persistent calling of the chick, which had already hacked a hole about half-an-inch wide in its shell. Eggshells were not removed, but simply trampled into the debris at the bottom of the cavity. We found that hatching reached its peak from about January 30 to February 3.

Day-old chicks of the Flesh-footed Shearwater are clad in down about one inch deep on the back. This down is medium gray above and light gray on the breast, belly and under the wings. The beak is gray-blue, the legs flesh-gray and the webs flesh colored.

Behavior at the Nest

Brooding the young.—In two instances where the time of hatching was known, the chicks were brooded for only two days before being left on their own by day. In three other cases where the chicks were found soon after hatching and their ages estimated with reasonable accuracy, these were brooded for 2, 3 and 3 days respectively before being abandoned by day. Both sexes took turns at brooding the chick. At one nest a chick, left alone after 3 days, was brooded again on the 5th day by the mate of the bird which had last been seen on the chick. This was the only

instance encountered where a nestling once left alone by day was subsequently brooded again.

Behavior of nestlings.—Once it has been left on its own by day the chick spends most of its time sleeping and tucking its bill into the down of the back. It looks like a gray fluffy ball. When handled it strikes at the fingers with its soft bill, perhaps reflecting the fierceness of the adult, but the movements it makes are the same as it uses against the parents when begging for food. The voice of the newly hatched chick is a soft piping, indistinguishable to me from that of other shearwaters at this stage of their lives. Chicks sometimes ejected a small amount of pale brown oil when handled, but none seemed to be able to squirt this substance, in the way that the Fulmar chick does. The bird sits in a neat cup of grasses, feathers and other items which it collects from the corners of its chamber, reaching out with its bill to add other scraps to the collection when the opportunity arises. This habit it shares with *P. puffinus* and *P. assimilis*.

Feeding the young.—It was customary to enter the blind at sunset, since if the chick was to be fed the parent would generally appear with the early waves of incoming birds. Both parents fed the young. Entry to the burrow was generally preceded by a series of chirrups from the chick which seemed to sense the old bird's presence, even though I had heard nothing. Sometimes the parent would crow as it entered, sometimes it was silent. The chick would not have long to await for its meal. Either might initiate the feeding process, the adult by lightly preening the young one's head with partly opened bill or, more often, the chick by driving its beak repeatedly towards the adult's head and chirruping continually. The adult would then open its beak so that the two became interlocked. The chick fell silent, its eyes closed and wings vibrated as it was fed. After about 5 seconds the bills were separated and both birds swallowed. The chick would be fed repeatedly in this manner, getting about 6 feeds in 10 minutes. High-speed photographs (Plate 1) show how the chick's beak lies on top of the adult's cupped tongue so that the disgorged food can be diverted from the one to the other. The old birds were sometimes quite silent when feeding, sometimes made peculiar gurgling noises.

Occasionally both adults would visit the nest and duetting might then take place. It seemed that the older the chick the more infrequently the visits of the two parents coincided. It was found that during the chicks' first 10 to 12 days in the nest they were visited on average about 6 times. The nestlings were seldom visited without being fed.

Other behavior of adults.—When food had been disgorged the adult bird would generally wander back up the tunnel to squat quietly outside,

perhaps to sleep with head tucked into the scapulars. Many birds were seen resting like this within a few minutes of the arrival of the main body after dark.

One night a parent bird tore at the vegetation surrounding the nest cavity, throwing pieces of it over its shoulder. This may have been a displacement activity, since my red light was flickering at the time. Another bird shortly after entering the nest indulged in an orgy of scratching, using both feet in turn and getting covered with dust and earth in the process.

On the few occasions when the nests were checked in the early hours of the morning, the adult bird seen there earlier that night was still present. It would seem that although the chick is fed shortly after the adult's arrival, the latter does not leave the island until the approach of dawn.

FLEDGING

Before leaving Eclipse Island five nests, located close to dwellings and containing young of known ages or whose dates of hatching were known to within two days, were numbered. Lighthouse-keeper W. McAuliffe undertook to check these nests, occasionally at first, and then nightly towards the end of April when the young would be expected to be ready to depart. This was duly done. Of these birds one 37-day old chick was found dead in the nest after a spell of bad weather in March and another at 56 days old apparently succumbed to the attack of some predator, since it disappeared leaving a pile of feathers around the nest area. Of the remainder, one left on the night of April 28/29 at 95 $\pm$ 2 days old, one left on the night of May 1/2 at 93 days old, and the other on night of April 25/26 at 89 $\pm$ 2 days. This gives an average fledging of about 92 days; a period which compares with that for the Greater Shearwater (*P. gravis*) given by Rowan of about 84 days, for *P. tenuirostris*, of 94 days (Marshall and Serventy, 1956), and for the Great-winged Petrel on Eclipse Island of 130 days. Mr. McAuliffe noted that two of the chicks sat outside their burrows on the night preceding their final disappearance from the nest. His records indicate that he seldom saw any adults in attendance during the later stages. However his observations throw no light on whether the chicks were deserted by the adults before their final departure or whether they were fed intermittently right up to this time.

ENEMIES AND INTER-SPECIFIC COMPETITION

Procellariidae on Eclipse Island seem to have few enemies. Bad weather causes the death of an appreciable number of chicks and there is also some mortality around hatching time even in fine weather.

Raptoral predation seems to be low. A harrier, *Circus approximans*, a sea-eagle, *Haliaeëtus leucogaster* and two hawks, *Falco berigora* and possibly *Accipiter fasciatus*, are potential predators, but all seem only casual visitors to the island and their effect must be small. But predation by skinks, particularly by the big king skinks (*Egernia kingii*) is probably quite serious, and many eggs with holes, apparently eaten by these reptiles, were noted.

The lack of avian predators would appear to make it unnecessary for these shearwaters to restrict their visitations of the breeding ground to the period after sunset, yet in their nesting they seem quite intolerant of daylight. Invariably the Great-winged Petrels were the first birds over the island in the evening, calling perhaps 30 minutes before the shearwaters first appeared. On Nightingale Island in the Tristan da Cunha group, Greater Shearwaters come ashore to court and sing in broad daylight despite the presence of skuas (which do not attack the adult birds). However, the density of shearwaters on Nightingale seems greatly in excess of that of *carneipes* on Eclipse: possibly the great shortage of nesting sites accounts for the diurnal visits of the Tristan birds.

Several authors have suggested that varied breeding seasons among petrels are advantageous or necessary in order that the limited nesting places be fully utilized. On Eclipse Island the winter-breeding Little Shearwaters require much smaller holes than the Flesh-footed species, but the winter-nesting Great-winged Petrels, while nesting freely on the surface, are also burrowers and certainly use many of the same burrows as do the Flesh-footed Shearwaters. It was interesting, therefore, to find Great-winged Petrels coming ashore in increasing numbers during our stay, many occupying potential nesting sites singly or in pairs, and a few even remaining on the island during the daytime. There was no sign of any competition between these and the Flesh-footed Shearwaters. There were many unoccupied burrows available, in some of which attempts had obviously been made at breeding but then were available for any bird prepared to occupy them. Had the petrels appeared 6 weeks earlier, however, when most of the shearwaters would have been laying and when non-breeding birds also were occupying burrows and "going through the motions" of breeding, then the petrels might have found difficulty in finding undefended sites. As it was, the petrels' arrival seemed nicely timed to take advantage of the increasing number of nest sites becoming available. One can visualize that by May, when the petrels must be present in great numbers, the remaining shearwater chicks in their burrows will have frequent visits from prospecting petrels. It seems possible that the same pairs return yearly to the same burrow and perhaps renew their alliances by meeting at the nest which they will

presumably attempt to occupy again. If the young *carneipes* has anything of its parent's aggressiveness it should have no difficulty in holding its own against the comparatively placid petrels. The reverse side of the picture may be different. In November the young Great-winged Petrel is ready to leave while the Flesh-footed Shearwaters are now numerous, egg-laying being only a month ahead. I should imagine that the petrel nestlings might then have difficulty in resisting eviction.

SUMMARY

The breeding of the Flesh-footed Shearwater (*Puffinus carneipes*) (Pale-footed Shearwater of the A.O.U. Check-list) was observed during a visit to Eclipse Island, Western Australia in late January-February 1956, during the southern hemisphere summer. Nest, courtship, voice, flight and locomotion on land are described. Comparison is made with other shearwaters.

Some of the birds assemble in rafts offshore towards evening. They only come to the nests after sunset, seem to shun light, and to be less numerous on land on moonlight nights. Nest entrances are often clogged with dead herbage apparently dragged there by the birds themselves.

The single chick is brooded for 2 or 3 days by either or both parents, and during their early nestling period they are fed on the average about 6 nights in every ten. The feeding operation is described with photographs. From three records the fledging period was found to be about 92 days. It is unknown whether a starvation period occurs in this species. The birds seem to have very few enemies except skinks. The possibility of competition between these summer-breeding shearwaters and the winter-breeding Great-winged Petrels, which often use the same burrows, is discussed.

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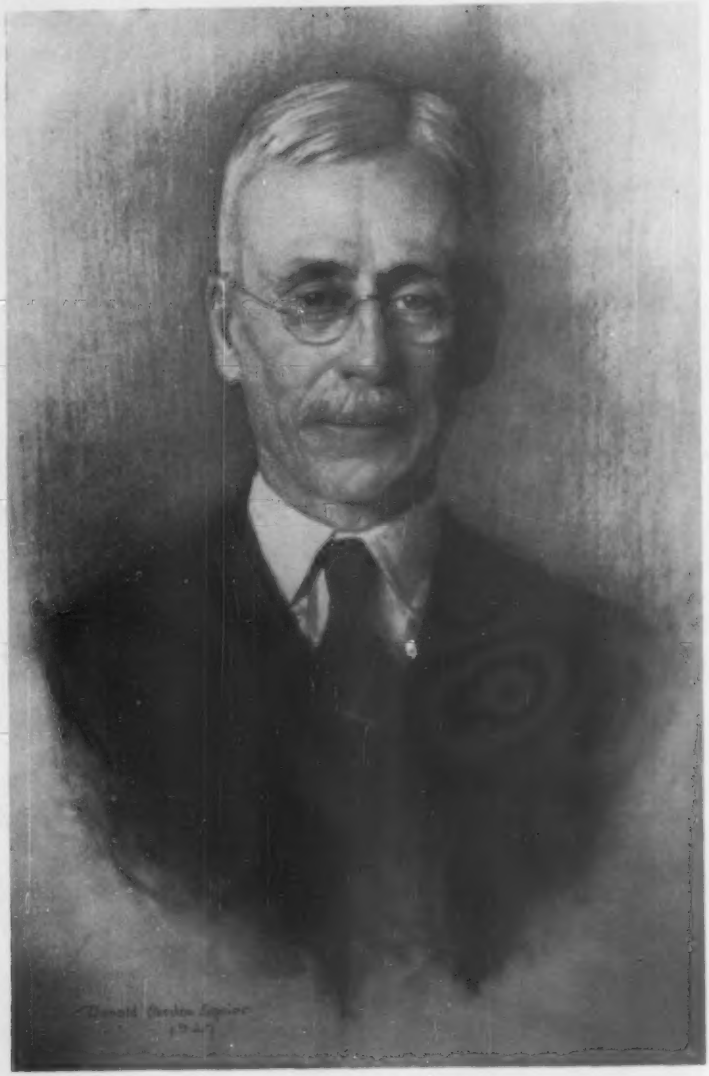

CHARLES FOSTER BATCHELDER

IN MEMORIAM: CHARLES FOSTER BATCHELDER

BY WENDELL TABER

CHARLES FOSTER BATCHELDER, last of the Founders of the American Ornithologists' Union and its eighth President (1905–1908), died at the age of 98 in his home in Peterborough, New Hampshire, on November 7, 1954. He had never taken out life insurance. Drily, he would remark he had figured he could beat the game. He failed, though, to achieve a minor goal, a life span of one hundred years. He had attained, easily, his major aim, the title of Senior Graduate of Harvard College. In 1953, when Nathan M. Pusey was celebrating his own "25th." and in process of being installed as President of Harvard University, Batchelder might well have led the parade of graduates at Commencement—in a wheel chair—celebrating his "Diamond Reunion"—alone! He refused. "Merely an object of curiosity." was his comment.

His parents, Francis Lowell Batchelder and Susan Cabot Foster Batchelder, had acquired a country estate at 7 Kirkland Street in Cambridge, Massachusetts. Here, directly opposite the back side of Holworthy Hall in the Harvard Yard, Batchelder was born, grew up, and resided for some months in winter for the rest of his life. Here, for about thirty years following the death of William Brewster, met the Nuttall Ornithological Club.

Batchelder, born July 20, 1856, hardly knew his father, who died when Batchelder was barely eighteen months of age. Ever an out-door lad as he grew up, he often wandered over the four miles or so to the little hamlet of Arlington, riding in due time one of those huge wheels with baby trailer-wheel which preceded the bicycle as we know it today. Of this period he has written, "Cambridge in the 'sixties was hardly more than a group of villages, and it was immediately bordered, especially on the west and north, by unspoiled country,—open fields and shady lanes, with old apple orchards and woodland, and well watered with ponds and marshes and streams. Beyond, stretched woods, meadows and old farms, farther than boys' feet or imaginations could carry them." Through this country had been strolling those boyhood pals, William Brewster and Henry Wetherbee Henshaw, Batchelder's seniors by five or six years. Association with an older group, E. A. Samuels, Henry Augustus Purdie, C. J. Maynard, and Ruthven Deane, quickly intensified the interest of the younger group in birds. Soon a newcomer to Cambridge joined the group, W. E. D. Scott. A childish interest became serious and ripened into devotion.

During this period F. L. Batchelder's widow, unable in her restricted financial condition even to afford a horse, had devoted herself to the

raising and education of a youth, delicate but tough, and a girl, who died about the time when, after completing his studies at the Cambridge public high school, Batchelder entered college. The proximity of residence and college enabled him to live modestly at home. He lacked those close contacts with his classmates arising out of dormitory life. In college he already had a nucleus of like-thinking outdoor friends, and he compensated for the lack of college life by a wise choice of friends on the Harvard faculty. He came in close contact with Alexander Agassiz, Curator of the Museum of Comparative Zoology, Theodore Lyman, Assistant in Zoology, Joel Asaph Allen, Assistant in Ornithology, Walter Faxon, Assistant in the Zoological Laboratory and Instructor in Zoology, and Asa Gray, Trustee of the Peabody Museum and Professor of Natural History. Particularly did he admire Nathaniel S. Shaler, Professor of Paleontology, and Henry L. Eustis, Dean of the Lawrence Scientific School and Professor of Engineering. Illness compelled him to withdraw, temporarily, from graduate work in this latter school. He returned in the autumn of 1880 and graduated in 1882 with the degree of M.E.S. (Now C.E.)

Leader of the local group of youngsters interested in natural history during the 'sixties, many still in their "teens", was William Brewster. Henshaw it was, though, who instilled in Brewster the idea that the two meet once a week to read aloud "Audubon" and to discuss it in the light of their own experiences. The others soon straggled in. Discussions widened. Without realization, the group became a "club" as it met in the attic of the Brewsters' house. Humorously true—and ever since a truth in fact—was Ruthven Deane's slip of the pen inviting Ernest Ingersoll to attend a meeting in the evening of November 24, 1873, "relative to forming an ornitholocal society." Not until March 5, 1877, did Batchelder, not yet twenty-one years of age, and a junior in college, become a member of the Nuttall Ornithological Club. By December 1, 1879, he was Vice President. He relinquished this position to become Treasurer on December 20, 1880,—and such he remained for the next half-century.

Through with his post-graduate work in 1882, he spent nearly a year collecting intensively in Colorado, New Mexico, Arizona and California. Travel, in those days, was an undertaking. Trains of a sort did exist. The horse ruled supreme. In constant communication with Brewster about the Bulletin of the Nuttall Ornithological Club which Batchelder had edited temporarily in 1882 during the absence of J. A. Allen, his duties as Treasurer, and other Club affairs, he tinted letters with remarks such as, "Didn't get a shot at a California Condor!" and "I must stop a moment to use a few California adjectives about this pen." Returning

home he followed his vocation during 1884 and 1885—his entire career in the business world. His frail constitution succumbed to the zest with which he tackled his profession. In April, 1886, he traveled widely in Europe where his ill health continued or renewed. Not until July, 1887, three months before returning to this country, was his health restored.

Confined much of the time to his quarters while in Europe, he concentrated on mental tasks. He outlined the information for labels, such as the date and place collected, the collector, and other pertinent data. He developed a type of check-list adapted to recording daily, a month at a time, the number of each and every species seen. The distant perspective of America brought forth the comment, "I have come to look upon the spring migration as one of the worst—instead of the best times for collecting."

Another trip to California in the spring of 1887 brought to a close Batchelder's ornithological expeditions far afield. Minor trips were to the Fort Fairfield region of Maine in 1879, North Carolina for about a month in the winter of 1885–1886, and the Catskill mountains in New York State in the summer of 1889.

Not until February 19, 1895, when he was approaching 39 years of age, did he marry. Laura Poor Stone Batchelder was not too many years younger. She survived her husband by less than two years. Of the four sons, the two younger, Charles Foster Batchelder, Jr., and Laurence Batchelder survive.

In June, 1899, the family moved into a newly constructed summer home at Seal Harbor in Maine where, hardly settled, they awaited the arrival of Edward Rand and the Ruthven Deanes. Due to the recurrent illnesses of the children, attributed to drinking water, the family moved from this home after a few years. Shortly after the turn of the century they acquired at Peterborough, New Hampshire, a large, almost pretentious estate where what "once was nearly an abandoned farm has afforded me almost unlimited opportunities for experiment. My efforts in developing it have not led towards intensive cultivation or other paths to wealth. More ambitiously, I have tried to lend nature a helping hand in showing how she can make its woods and waters more interesting and beautiful. Sometimes she is responsive, but happily there is no danger of my undertakings reaching such complete fruition that I shall be left with idle hands at the end."

In the 1930s, when the children were grown, the Batchelders toured Ireland, especially, where they visited in a thatched cottage with dirt floor the parents of their servant. On the same trip, they toured England. During this period, too, the Batchelders would head south in winter at times, visiting places such as Biloxi in Mississippi and Mexico City.

On one occasion, not too distant from Peterborough, a new chauffer tipped over the automobile. Batchelder, the only other occupant of the car, scrambled out unhurt.

Increasingly, in this final third of a century, the Peterborough home became known for its comfortable, yet unassuming open hospitality. The offhand caller could be assured of an invitation for lunch or dinner. Smiling "with his eyes" as one child put it, Batchelder would merely remark, "The servants like company."

Friends of many years' standing found excuses to drive to Peterborough on a summer Sunday. In one instance, Robert Walcott and Laurence B. Fletcher arrived to find Batchelder "pounding away on his typewriter" and surrounded by card catalogues. At the same time he was keeping a minute account of the daily schedule of "hedgehogs" (subsequently published, 1948) that lived under his barn and moved up on a tree outside his window for their evening meal. About a year before he died he bought a brand new typewriter.

Batchelder had a remarkable ability to ask questions in a way that did not antagonize. Rather, the questions led on the person to elaborate on his statement. Batchelder was well aware of his own possession of a penetrating ability to analyze his fellow humans with a skill that increased with the passing years and the background of experience. He delighted in the application of this talent. He could dissect with equal skill, favorably or unfavorably, a contemporary, or some ornithologist out of the dim, distant past. He had a subtle, dry humor of the British type. He took impish delight in telling a caller how his great grandfather arrived "a little late" at the battle of Lexington. Off guard with intimate friends, he had a habit of thinking outloud. Abruptly changing the line of conversation one day, he quietly remarked, "You know, I think —— is beginning to get old [85 years of age]. I was very much tempted to give him a piece of my mind, but, under the circumstances, I think perhaps the best thing to do is to let matters slide." Batchelder was a mere 95!

The formerly widespread impression that the Nuttall Ornithological Club had founded the American Ornithologists' Union was a constant source of distress to Batchelder, always a stickler for accuracy. Ultimately, 1937, he published the setting and background of this historic event. The originating Founders did not consult the Nuttall Club. In fact, they sent invitations only to a mere three or four of its members, and the members of the club as a whole were, initially, utterly unaware of the undertaking. The Nuttall Ornithological Club "felt no great enthusiasm for the new-born Union, especially when it was asked—and by pressure of circumstances rather unwillingly compelled—to give up publishing the 'Bulletin', in order not to interfere with the Union's

plans for a similar publication of its own." Helping to perpetuate the erroneous impression was the fact that "the Union took over all it could of the Bulletin—the Editor, the arrangement of contents, style of topography and of paper. It even was clearly suggested that it might willingly take the contents of the Club's Treasury."

Batchelder served as Associate Editor of 'The Auk' from 1888 to 1893. Prior to becoming President of the A. O. U. he had acted as Vice President for the period 1900–1905.

Down through the generations continued the Nuttall Ornithological Club as it had been—a close-knit, compact, friendly for the most part, group of ornithologists functioning not as a club, but on their own—sharpening their intellects by intellectual intercourse. Except for the year, 1875–1876, when Purdie was President, Brewster held the Chair until his death in 1919. Associated with this era in addition to members already mentioned were Francis H. Allen, Outram Bangs, Thomas Barbour, Arthur Cleveland Bent, Henry Bryant Bigelow, Charles Barney Cory, the three Deane brothers, George C., Ruthven and Walter, Jonathan Dwight, Walter Faxon, Joseph A. Hagar, F. Seymour Hersey, Ralph Hoffman, William A. Jeffries, Frederic H. Kennard, John B. May, C. J. Maynard (resigned 1876), Gerrit S. Miller, Albert P. Morse, John Murdoch, John T. Nichols, James Lee Peters, John C. Phillips, Theodore Roosevelt, John Eliot Thayer, Charles Wendell Townsend, Winsor M. Tyler, Robert Walcott, and Francis Beach White. In a later generation came Josselyn Van Tyne, with whom a life friendship developed.

Who wouldn't have a host of marvellous memories! Batchelder had taken Jim Peters into his own home during a two weeks' illness before the first World War and long before Peters married. White, a faithful attendant at meetings and coming from Concord, New Hampshire, was as regular an overnight guest. Hoffman originally was "not careful" in his work, but then the quality improved. Batchelder "blew cold", but with versatility changed his opinion and "blew hot." Of the two Harvard undergraduates who dropped in to meetings together, Henry D. Minot and Theodore Roosevelt, he wrote, "I am afraid some of us looked on the two a little askance. We recognized their ability, but both seemed a bit too cocksure and lacking in the self-criticism that, in our eyes, went with a truly scientific spirit. But they were young—and so were we!"

Glover M. Allen succeeded Brewster as president of the Nuttall; Jim Peters took over after Glover's death. The era of binoculars and telescopes commenced. Batchelder wisely wrote, "rules may help chiefly in visualizing the question, but it must be remembered that the difficulty often lies not in testing the observed facts but in dealing with the observer's mind."

As far back as 1895 Batchelder had written Brewster offering the use of his Cambridge house for Nuttall meetings in the event Brewster's museum should be closed, even temporarily. It was only natural, therefore, that Batchelder should take over upon Brewster's death. Never in front, ever the power behind the scenes—not that one was needed in that congenial atmosphere—Batchelder refused in 1942 to accept even a courtesy election as President, designed to inscribe his name on the roster; without opposition, he could have been the active President.

Once a month through the winter period the inner group of the Nuttall met for dinner, rotating from one member's home to another. The membership comprised Outram Bangs, Thomas Barbour, Batchelder, William Brewster, Walter Deane, Joseph L. Goodale, William A. Jeffries, Frederic H. Kennard, Edward Rand, Henry M. Spelman, Charles W. Townsend, and possibly others. Arthur Cleveland Bent belonged for a time, but found the difficulties of transportation to his home in Taunton rendered the trip impracticable—and it may be doubted that the other members were particularly desirous of the inevitable rotation taking them so far afield.

Almost certainly, it was 'Batch' who originated the New Year's Celebration, the first meeting of the Nuttall Club in each calendar year, which became an institution in its own right. Such an occasion has been recorded for all time in 'The Auk' for 1955, vol. 72, opposite page 64. Answering a question from Harold Bowditch as to why he called the punch "Fires of Spring", Batchelder countered in a flash, "Why? Well, you know how you build a bonfire in the spring. You rake up the yard, dead grass, twigs from the trees, perhaps a shingle or two that have blown off the house, and scraps of all kinds. That is how I made the punch. I went into the cellar, where I found a little of this and a little of that and put them all together, and that made the punch. Fires of Spring."

Eagerly anticipated, too, were the gala, festive gatherings to honor some member, William A. Jeffries, for example, upon completion of fifty years of membership. Attributed to Roger Tory Peterson just elected a member, was the remark, as he noted four men standing at a table, engaged in deep discussion, "Just look, Glover Allen, Cleveland Bent, Francis Allen, Charles Townsend—and you could cover them all with a blanket." The blanket was proffered.

Inevitably, the composition of the Nuttall Club membership changed. Cambridge failed to provide a flow of talent to replace bygone generations. Increasingly, the accent shifted from the approach of the Brewster era to concentration on the migrations or winter bird life, as exemplified in popular field trips. Ultimately, after having politely sat through

many meetings unable to hear more than an occasional word of what was going on, due to increasing deafness, and having difficulty in recognizing members as his eyesight failed, Batchelder was happy to have me take over the housing of meetings after that of April 18, 1949. The death of Jim Peters on April 19, 1952 marked, he feared, the end of the club as he had known it.

An individual, whose more than casual contact did not commence until Batchelder was in his seventies, defined him as "hard to know, incurably suspicious of strangers, but generous and hospitable to a fault once his liking and approval had been given. Further, he was thought a snob, as he would not know or bother to remember younger birders—until they had become persons of some importance. He took the A.O.U. and the Nuttall, which in later years he saw in a golden haze of imaginary glory, with almost preposterous seriousness. Although a marvellous editor, he required ample time and unlimited money."

Certainly, there was little more than a "slight modicum" of truth in this writer's remarks. One has to discount, heavily, the first two sentences of the criticism if he takes into consideration severe deafness on top of extreme age. The writer also lacked the background of history in the A.O.U. and in the Nuttall. Just what *is* a man between 70 and 98 years of age expected to concentrate on? And Batchelder was even more handicapped when, in August, 1943, due to poor eyesight, he stepped into a depression in the ground on his lawn in Peterborough, fell, and broke his hip. For the next 11 years he used crutches.

As an editor, he had been gifted with the ability to obtain whatever funds he found necessary—an ability to be envied. He had, himself, recognized the time-defect. As far back as June 28, 1906, he wrote Brewster from Falmouth, Massachusetts, "physical limitations to the amount of work that I could do at a stretch have often made the work of printing move much more slowly than it might have done."

Batchelder was one of the Founders of the New England Zoological Club in 1899. The details and list of members are available in Volume X of the 'Proceedings', 1929. Summarizing the record, Thomas Barbour wrote, "An enterprise of this nature sinks or swims, depending upon its editor. It may either become slipshod and amateurish or offend equally by an attempt at preciosity or elaboration, if its editor is not—not devoted alone—but competent. Charles Foster Batchelder during these thirty years has built a modest but enduring monument in this neat series of volumes not only wholly satisfactory to see and feel but astonishingly faultless in all details of language, citation and form." Further, he placed the 'Proceedings' in the mail on the actual date of publication!

Batchelder was, perhaps, a bit short-sighted. If the standing of the

club were to be maintained, younger generations should have been brought along. Objecting to the publication of papers by non-members, he wrote Bangs in 1901, making the point that established mammalogists already had access to outlets for publication. "Only the younger, unknown group would use" the 'Proceedings'.

Yet another facet of this broad-minded, versatile scientist was his interest in botany. Richard J. Eaton has written that, although Batchelder had taken elementary and advanced courses in this subject in college under Professors Goodale and Farlow, "It was not until December, 1905, that he accepted election to resident membership in the New England Botanical Club and thus afforded himself a stimulating contact with active botanists, both professional and amateur. During the next thirty years he rarely missed its monthly meetings and was a frequent contributor to discussions of the paper of the evening. The flora of southern New Hampshire was not well represented in any herbarium, so it seemed appropriate to concentrate on the southern tier of counties readily accessible by carriage and motor car from his home in Peterborough. He systematically pursued this undertaking for the next thirty years, generally with Mrs. Batchelder as coachman, chauffeur, and companion. The Club Accessions Book records a total of 5,776 sheets received from Mr. Batchelder during the years 1914 through 1939. It is suspected that this figure is an understatement of his contributions to the Club. He appears to have regarded his scientific attainments in botany with extreme skepticism. I can find but a single published article on the subject over his signature, viz.: 'Two Grasses New to New Hampshire', Rhodora, 14:175 (1912)."

In the year 1933–34 he became officially connected with the Museum of Comparative Zoology at Harvard as Associate in Mammalogy. He was at that time only some 77 years old. From 1934 to 1942 he was Associate in Mammalogy and Ornithology and from 1942 to 1948 Research Fellow in Mammalogy and Ornithology. Beginning, finally, to get old, he reverted during the period, 1948 to 1954 to the position of Associate in Mammalogy and Ornithology.

He was a Fellow of the American Academy of Arts and Sciences and of the American Association Advancement of Science and at one time or another belonged to the Boston Society of Natural History, the Washington Academy of Sciences, and the Biological Society of Washington.

Strong was his dislike of C. J. Maynard, joint Editor with H. A. Purdie of the intial issue of the 'Bulletin of the Nuttall Ornithological Club', six days late in appearing. Maynard, disregarding further responsibility, departed on a collecting trip from which he returned in

July. He had been replaced by J. A. Allen. Time softens feelings. One has to believe Batchelder in the last few years of his life felt he had been unduly severe on Maynard. In atonement, Batchelder slowly and laboriously compiled a "Bibliography of Charles Johnson Maynard", a fitting finale in 1951 to his own lengthy bibliography. Maynard's papers were many, frequently short items in out of the way publications. Batchelder was terribly perturbed, later, to discover he had overlooked an item. Batchelder prepared his own meticulous bibliography, here appended.

Consistent with a life-long practice, he went yet once again to the hospital, in Boston in 1954. Returning to Peterborough, he failed rapidly. As I rose to leave one afternoon shortly before his death, his eyes grew suddenly large and clear with an undescribable mischievous sparkle. In a strong, ringing voice, utterly unlike his conversational intonations of the previous half hour, he called,

"Glad to have known you."

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COMMENTS ON THE PHYLOGENY AND SKULL OF THE PASSERIFORMES

BY M. JOLLIE

The publications of Beecher and Tordoff have stirred discussion relative to the classification of the oscines, particularly the nine-primaried ones of the New World. Comments on the phylogeny of this group have been limited to those who are primarily systematists and not comparative anatomists. As a representative of the latter group I would like to call attention to certain aspects of skull structure and to express certain views which may help to refine our knowledge of the phylogeny of the oscines and suboscines.

Comments on Recent Papers

Tordoff (1954 a and b) has described the palates of the oscines and has placed considerable weight on the occurrence of the "palato-maxillaries." It is noteworthy that there is no mention of the development of the bones of the palate as observed in nestlings, nor is there any attempt to relate bony configuration to muscle form. Tordoff (1954a: 25; 1954b: 275) hypothesizes that the palato-maxillaries are an adaptation for feeding on seeds and fruits. Other species with a similar diet appear to lack this structure, yet this has not been taken into consideration. A study of functional anatomy should require more than a survey of the adult structure and a more positive kind of correlation.

Beecher's (1950 to 1953) studies of the jaw musculature of oscines is open to criticism. The illustrations, which have been cited as a major contribution to anatomy, only support the conclusions in part. One wonders why, for example, the shrikes were not placed closer to the corvids and Old World orioles, which from his drawings they resemble in their myology. The assumption that parallel fibers are the primitive style and various grades of pinnate the advanced state has already been discussed by Tordoff (1954). Supplementing his remarks is the point that the development of a muscle is a functional response. Pinnate and parallel fibers are adaptations; the one enables greater tension to be produced, the other has greater contractility. There is doubt that one is more primitive than the other since both were probably present in the reptilian ancestors of birds. I must agree with Tordoff (1954b: 282) that "Perhaps all that can be said is that both parallel and pinnate jaw muscles occur, in various groups throughout the world."

Beecher's (1953: 272) assumption that muscles "are more conservative than bones," disregards a great deal of comparative study, including that of the jaw muscles (*see* Starck and Barnikol, 1954). The anatomist

can only accept the proposition that sometimes myology will yield valuable features, while elsewhere bone characteristics will be more useful.

As to the taxonomic value of the jaw muscles described by Beecher, it is not surprising that they should have limited use in such a closely related array as the oscines, since the bill form and the use of the bill, with which they are associated, already indicate the same relationships in most cases.

The search for the restricted group of anatomical features on which to base a phylogeny must end in disappointment. This comment might lead one to return to the safe attitude that an anatomical solution to the classification of birds is next to the impossible. To the contrary, both of these contributors have helped clarify relationships within the oscines. What is needed, in the words of Tordoff, are "more studies of both bones and muscles." We need more facts concerning both developmental and adult anatomy. Facts from experimental manipulation during development would also be desirable. It is also clear at this time that we need to know how to interpret information (i.e., to discern the phylogenetic lines) as much as we need new information.

As a step in this direction, I would like to discuss certain aspects of the skull structure. This discussion is based on an examination of the materials in the osteological collections at the Museum of Comparative Zoology at Harvard University, the American Museum, and the United States National Museum. A list of the species examined was not kept although notes were taken on representative specimens of many passeriform families (Appendix 1). It was largely from these notes that the views expressed here were derived. Developmental stages (Appendix 2) for a restricted number of passeriform families were collected, along with adult examples. These are in the writer's possession. This study is a part of a more general one supported by National Science Foundation Grants (G–1737, G–3861).

FEATURES OF THE SKULL HAVING POSSIBLE PHYLOGENETIC VALUE

The "palato-maxillaries". The development of the passerine skull has been described at length by Parker (1874-77), yet the true nature of the "palato-maxillaries" has been lost (*see* Amadon, 1950; Tordoff, 1954a; and Mayr, 1955). It should be stated at the start that the palato-maxillary, as it occurs in the Emberizidae, is a remnant of the palatine process of the premaxilla, not a new bone (fig. 2). A palatine process is characteristic of all birds (about 15 orders examined—figs. 1–4). In the families Accipitridae (fig. 1A) and Falconidae these processes are most reduced (vestigial).

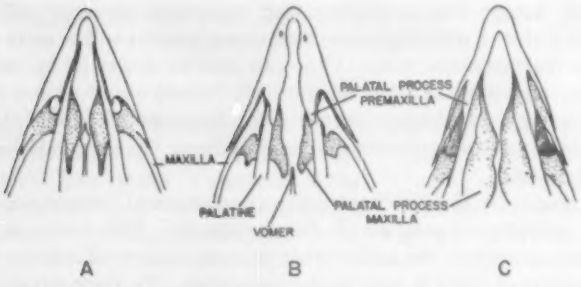

FIGURE 1. Ventral view of anterior tip of palate showing the palatal process of the premaxilla. *A*. Cooper's Hawk (*Accipiter cooperii*) just before hatching; *B*. White Leghorn Chicken (*Gallus gallus*) just after hatching; *C*. Great Horned Owl (*Bubo virginianus*) four week old nestling.

The fate of these processes varies: generally they fuse to the palatine (prepalatine process of above authors), though they may fuse with the maxilla or remain free. A free palatine process may be large or small, or it may be cut off from its basal attachment by movement in this palatine hinge area (as in *Junco*, fig. 2). The palatine process of *Acanthorhynchus tenuirostris* (Meliphagidae—as illustrated by Parker, 1877–79, pl. XLVII) is unique in that it lies medial to the anterior end of the palatine, not lateral or ventral to it as in most birds. Details of the development and fate of the palatine process of the premaxilla may contribute evidence as to the phylogeny of the oscines.

The pterygoid. Recent discussion of the palaeognathous palate by

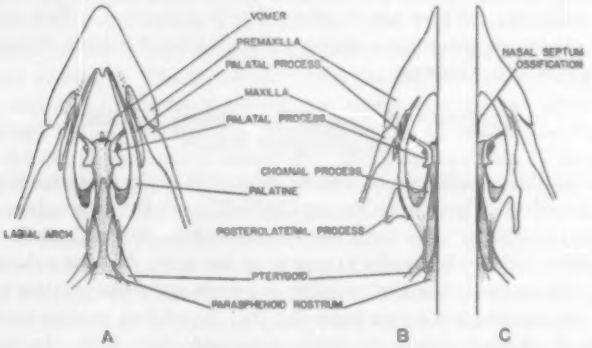

FIGURE 2. Palates of three stages of Oregon Junco (*Junco oreganus*), Family Emberizidae. *A*. Juvenal at time of nest leaving; *B*. Fully fledged juvenal; *C*. Adult.

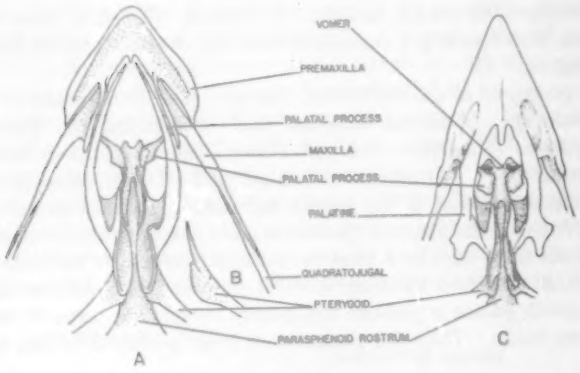

FIGURE 3. Palates of two stages of the House Sparrow (*Passer domesticus*), Family Ploceidae. *A*. Nestling about half grown; *B*. Pterygoid moved to the right to show anterior part; *C*. Adult.

McDowell (1948) and Hofer (1955) gives reason for reviewing the relationship between the vomer and the pterygoid. Figures 3A, 3B and 5 show that in the nestling passerine the pterygoid is a unit structure as in the palaeognath and its anterior end is associated with the vomer (fig. 5). Later in development this association is confused. We must adopt new terminology in order to describe more clearly this area. In the passerine what has been called the "pterygoid" is actually only the posterior part of that bone; the term posteropterygoid would be a more useful name. The anterior part, the anteropterygoid (= hemipterygoid,

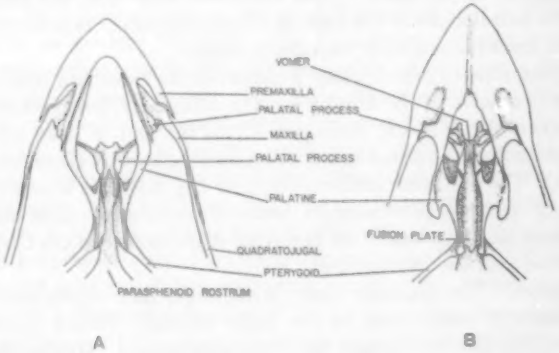

FIGURE 4. Palates of two stages of House Finch (*Carpodacus mexicanus*), Family Fringillidae. *A*. Nestling about half grown; *B*. Adult.

mesopterygoid of many authors, *see* Pycraft, 1900–03), fuses to the palatine, thus creating a compound bone which can be called the palatopterygoid.

The pterygoid is not subdivided into two parts in all passerine birds. In *Taraba sp?* (American Museum 5342—Formicariidae), *Xiphorhynchus guttatus* (American Museum 5753—Dendrocolaptidae), and *Glyphorynchus sp?* (American Museum 5077—Dendrocolaptidae) the pterygoid is like that of the woodpecker and its anterior end is incompletely fused to the palatine (just as in most palaeognaths). Among the Piciformes there may be a joint between the parts as in *Indicator variegatus* (U.S. National Museum 428639). From this it follows that the palaeognath palate is present and hardly modified in some of the neognathous birds. Thus the passerine is more primitive in this feature

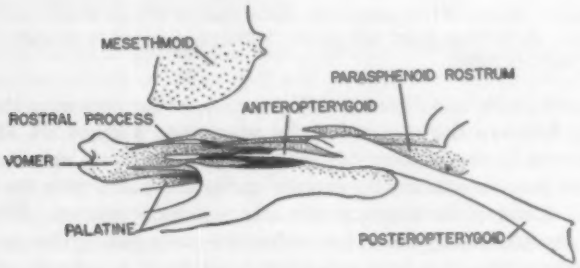

FIGURE 5. Dorsolateral view into orbit of nestling House Sparrow about half grown.

than many of the so-called "lower orders of birds" (i.e., the chicken, in which the anterior end of the pterygoid arises separate from the posterior part and fuses immediately with the palatine).

The posteropterygoid is fairly constant in its form and relationships with the exception of the development of an epipterygoid process in the woodpeckers (fig. 6A, *see* Verheyen, 1955: 14) and in *Sitta* (Sittidae). This process may be related to the wood-pecking habit of these two groups of birds. The passerine posteropterygoid (fig. 6B) has a small, dorsal projecting, *quadrate process* on its posterior, outer end. This small process is fairly characteristic of the group but it also occurs in the Coraciidae, Meropidae, and the Momotidae.

The vomer. The passerine vomer is extremely modified in that it fuses with chondral ossifications of the nasal capsule; Parker (1872: 224; 1875–79: 108, 109) has stressed this compound nature. He also described as "septomaxillaries" separate nasal capsule ossifications which I have observed only in the non-passerine species *Monias benschi* (U.S. National

Museum, 290927). The compound nature of the passerine vomer can be identified by the term vomeroturbinal. A vomeroturbinal perhaps is limited to the passerines—observed (?) elsewhere only in a specimen of *Nyctibius aethereus* (U.S. National Museum 321588).

The prefrontal (=lacrimal of most present authors). In the passerines this bone may be large or absent (*see* Beecher, 1953, figures); in the group as a whole it tends to be reduced in size. It may be present (well developed or vestigial) or absent within a family (Icteridae). In some species it does not appear even in the early stages of development. Because of this variation it may be an indicator of the phylogenetic position of different families, subfamilies and genera, since it

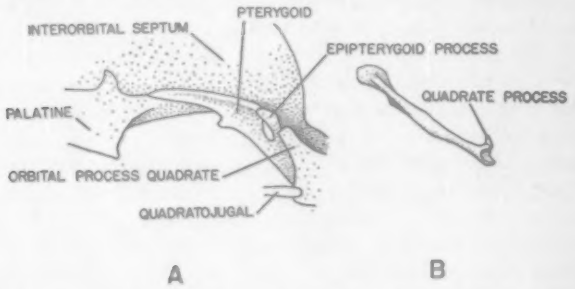

FIGURE 6. *A*. Dorsolateral view into orbit of Pileated Woodpecker (*Dryocopus pileatus*). *B*. Posteropterygoid of Common Raven (*Corvus corax*) as seen from same angle as in *A*.

can be assumed that in this case a well developed bone is more primitive than a small one or the total absence of this structure.

There is no evident adaptive value to reduction in size of the prefrontal, although it may be related to body size. Reduction in size of the body has usually been greater than that of the eye with the result that this bone may have been crowded out by the relative expansion of the orbit. This, however, is not the whole story since the passerine skull features an increase in size of the lateral ethmoid plate which lies in front of the eyeball. This plate has displaced the prefrontal forward so that it no longer forms the anterior margin of the orbit. This type of orbital modification is shared with the Caprimulgiformes and Apodiformes. Also not all small species lack the prefrontal; for example, *Troglodytes* has it.

The same pattern of reduction of the prefrontal appears in the suboscines and supports the supposition that the primitive bird was of medium size and less narrowly adapted to food source or environmental niche. Thus very large species and very small ones represent specializa-

tions in response to abundant or limited food niches—limited meaning food sources which offer a small volume of matter for each unit ingested, as well as limitation in the number of units available.

Absence of jugal. The jugal bone is missing from the labial arch of the upper jaw (zygomatic arch, quadratojugal arch) in the nestlings of passerines examined (Appendix 2). This lack is shared with the genus *Falco* and possibly with other groups and might be correlated with increase in relative size of the orbit. In this feature the passerine may be considered a specialized type. The labial arches of many more species will need to be investigated before any conclusions can be reached.

"Ectopterygoid" ossification. In the development of the oscine, the posterolateral angle of the palatine ossifies separately (seen only in *Junco oregonus* and *Pica pica*—observed also by Parker, 1875–79: 109, and called the transpalatine bone). This ossification appears about the time the juvenal is fully fledged; within a week it has fused to the palatine. That this bone is not a true part of the skull assemblage is shown by its association with the palatine muscle and its late appearance.

Holorhiny versus schizorhiny. This problem (Hofer, 1955) presents the difficult question, of which came first. It can only be assumed that holorhiny was primitive since this is the condition of the reptile, but the type of holorhiny is open to question, and it could in fact have been the style which Hofer has termed, "atypical schizorhiny" (better identified as incisorhiny?). In the passerines the situation is not as complex as in the Class Aves as a whole. Here the primitive, holorhinal opening has a nicely rounded posterior angle. Modification of form toward schizorhiny is correlated with elongation and narrowing of the upper jaw and changes in the relationships of the nasal capsule to the outer bones; these changes accompany retention of movement in the fronto-nasal hinge. A schizorhinal condition is approached by some dendrocolaptids and furnariids. A more rounded nasal margin (superholorhiny!) has developed in many short, thick-billed types. Thus, in the passeres, both extremes appear to be specializations.

The same sequence probably occurred in the Class as a whole but the pattern cannot be followed for the simple reason that both styles occur in closely related groups, indicating independent variations. This seems to be a functional characteristic related to several variables and probably modification has gone independently in either direction. I am inclined to agree with Hofer that the incisorhinal type appears to be the primitive form.

DISCUSSION AND CONCLUSIONS

The skull of the passerine does not differ markedly in any feature from types found in "lower groups" but it does differ on the basis of a combination of features. This skull cannot be considered as more specialized than that of other groups; to the contrary it must be considered less specialized than many. Reduction in the size of the prefrontal of passerines suggests that, as in other orders, the families consisting mainly of medium-sized species (in terms of all kinds of birds) are the primitive. Since the medium-sized species are actually the largest passerines, evolution in this group has tended toward small species fitting into restricted habitats where small food units are available. From this we can assume that the crows and the several Australian families of large "blackbirds" (Callaeidae, Grallinidae, Cracticidae—including *Pityriasis*, Ptilonorhynchidae, Paradisaeaidae) are remnants of the ancestral oscine population—showing specialization, it is true, for various ways of life. Close to these would be the starlings, and in the nine-primaried assemblage the American blackbirds (Icteridae).

Where, or how, the small groups arose is not clear, since in their extreme specialization their origin has been obscured and can only be determined through detailed study (which as yet has not been carried out). It does not seem out of place to say that a recent approach (Mayr and Greenway, 1956), which lists the families with small species as if they were the more primitive and those with the large as if they were the more advanced (apparently on the basis of brain development), has reversed the real order of things. Admittedly the contemporary species, whether large or small, have been separated from their common ancestor for the same length of time, but the larger ones have probably retained more of the ancestral features in a recognizable form.

SUMMARY

Recent contributions to the phylogeny of the oscines are discussed and certain features of the anatomy of the skull reviewed. It is suggested that the form of the prefrontal is of value in determining the direction of evolution in the oscine. The development of this bone indicates that the large species of this suborder, as represented by the crows, are the more primitive while the small species are the more specialized. Other features of the skull suggest that the passerines may not be the most advanced birds.

APPENDIX 1

Representative species of passeriform families on which much of the comparative study is based. For convenience in reference (and not as an indication of the writer's opinion) the order is basically that of Wetmore (1951). The association of *Picathartes* with the Sturnidae and *Pityriasis* with the Cracticidae represents the writer's views.

Suborder Eurylaimi. Eurylaimidae: *Calyptomena viridis, Smithornis capensis, Corydon sumatranus.*

Suborder Tyranni. Dendrocolaptidae: *Xiphorhynchus guttatus, Glyphorynchus sp., Dentrocolaptes picummus.* Furnariidae: *Upucerthia dumetaria, Automolus sp.* Formicariidae: *Taraba sp.* Rhinocryptidae: *Pteroptochus albicollis.* Cotingidae: *Pipreola riefferii, Rupicola peruviana, Cephalopterus ornatus.* Pipridae: *Pipra mentalis.* Tyrannidae: *Pipromorpha oleaginea, Tyrannus tyrannus.* Oxyruncidae: *Oxyruncus cristatus.* Phytotomidae: *Phytotoma rara.*

Suborder Menurae. Menuridae: *Menura superba.*

Suborder Oscines. Oriolidae: *Sphecotheres vieilloti.* Corvidae: *Pyrrhocorax pyrrhocorax, Podoces panderi, Corvus corax.* Cracticidae: *Pityriasis gymnocephala, Strepera graculina, Gymnorhina tibicen, Cracticus torquatus leucopterus.* Grallinidae: *Struthidea cinerea, Corcorax melanorhamphos.* Ptilonorhynchidae: *Ptilonorhynchusv iolaceus, Loria loriae.* Paradisaeidae: *Astrapia stephaniae, Paradisaea apoda.* Sittidae: *Sitta carolinensis.* Timaliidae: *Garrulax canorum, Garrulax striatus.* Pycnonotidae: *Microscelis virescens.* Troglodytidae: *Troglodytes aedon.* Laniidae: *Lanius collurio.* Callaeidae: *Callaea cinerea, Heteralocha acutirostris.* Sturnidae: *Gracula religiosa, Scissirostrum dubium, Picathartes oreas.* Meliphagidae: *Foulehaio carunculata, Anthornis melanura.* Zosteropidae: *Zosterops montana.* Parulidae: *Mniotilta varia, Seiurus aurocapillus.* Icteridae: *Ostinops decumanus, Cassicus sp., Sturnella magna.*

APPENDIX 2

Developmental stages, in the possession of the writer, used in the preparation of this account. Adult specimens of each were also available. The arrangement of families is modified from Wetmore (1951).

Hirudinidae. *Hirundo rustica:* 1 specimen, nearly fledged.

Corvidae. *Pica pica hudsonia:* 20 specimens of fifteen stages, half incubated to fully fledged.

Mimidae. *Dumetella carolinensis:* 1 specimen, half fledged.

Turdidae. *Turdus migratorius:* 1 specimen of each of two stages, half fledged and nearly fledged.

Sturnidae. *Sturnus vulgaris:* 8 specimens of four stages, half to fully fledged.

Icteridae. *Quiscalus quiscula versicolor:* 1 specimen nearly fledged.

Ploceidae. *Passer domesticus:* 5 specimens of four stages, half to fully fledged.

Emberizidae. *Junco oreganus:* 1 specimen of each of three stages, half to fully fledged.

Fringillidae. *Carpodacus mexicanus:* 1 specimen of each of three stages, just hatched to nearly fledged.

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STATUS OF GREBES IN EASTERN WASHINGTON

By Charles F. Yocom, Stanley W. Harris and Henry A. Hansen

Since 1947, Eastern Washington has been the scene of an extensive program of waterfowl breeding ground surveys and studies. Incidental to these studies, the authors have collected rather extensive data concerning the status of the five species of grebes found in the state. They are Western Grebe (*Aechmophorus occidentalis*), Red-necked (Holboell's) Grebe (*Podiceps grisegena holböllii*), Horned Grebe (*Podiceps auritus cornutus*), Eared Grebe (*Podiceps caspicus californicus*), and Pied-billed Grebe (*Podilymbus podiceps podiceps*).

Area and Period of Study

Figure 1 shows that portion of Washington which is considered in this paper. The climate, topography, and vegetative zonation of the region have been described adequately by Yocom (1951), Daubenmire (1943), and Bretz (1928; 1932). The general region is one of limited rainfall, which occurs mostly in the winter months; much of this limited precipitation is collected in the many lakes, marshes, and depressions in the channeled scablands of the region during the spring run-off season. In addition, many of these scabland lakes apparently are supplied from underground water sources and hence are permanent waterbodies. Most of the waterbodies are relatively basic and support high populations of microcrustaceans (Fairbanks, 1950). For the most part, fish generally are absent from the potholes, marshes and shallow lakes, and are abundant in the deeper lakes.

The present paper summarizes the data on grebes that were collected by Yocom and Hansen from 1947 through 1954 on regular region-wide waterfowl breeding ground surveys, and by Harris (1954) during intensive studies in the Potholes Area of Grant County in 1950 and 1951. Most of the observations included are for the summer months; but Hansen conducted regular counts of waterfowl and grebes during the springs of 1948 through 1954 in Adams, Lincoln, Spokane, and Whitman counties. Harris's data for the Potholes Area of Grant County for the spring and fall of 1951 are rather complete. The authors have supplemented these records by other somewhat random observations made over the entire area in the winter, spring, and fall.

Status in Winter

Grebes are generally absent from eastern Washington between December 1 and March 15, although the ordinarily mild winter climate allows rivers and a few lakes to remain ice-free during most winters.

Single individuals or small flocks of Pied-billed Grebes occasionally spend the winter on rivers or lakes, but even these are rare, as is indicated by the fact that we only have nine records for the period of November 15 to March 1: two late November records for the Palouse River, Whitman County; four December records for the Snake River, Whitman County; one December record for the Yakima River, Yakima County; one January record for the Spokane River, Spokane County (Hudson and Yocom, 1954); and one February record for the Potholes Area, Grant County (Johnsgard, 1954).

In addition to these few Pied-billed Grebe records, we have a record of an unidentified grebe, probably an Eared or a Horned Grebe, on Kalotus Lake, Franklin County, on December 19, 1950; one Horned Grebe seen on the Snake River at Clarkston on January 27, 1952; and a Horned Grebe in winter plumage was taken at Pullman in January (Hudson and Yocom, 1954).

SPRING MIGRATION

After mid-March and during the month of April, all five species of grebes migrate into Eastern Washington in considerable numbers. Some of the earlier spring dates and localities are shown in Table 1.

TABLE 1

ARRIVAL DATES FOR GREBES IN EASTERN WASHINGTON

Species	*Earliest Date*	*Locality*
Western Grebe	March 29	Sprague Lake, Lincoln County
	March 29	Moses Lake, Grant County (Johnsgard, 1954)
	April 2	O'Sullivan Dam, Grant County (Harris and Yocom, 1952)
Red-necked Grebe	March 26	Lenore Lake, Grant County (Harris and and Yocom, 1952)
	April 15	Adams County
Horned Grebe	March 31	Palm Lake, Adams County
	April 14	O'Sullivan Dam, Grant County (Johnsgard, 1954)
Eared Grebe	March 23	O'Sullivan Dam, Grant County (Johnsgard, 1954)
	March 31	(Hudson and Yocom, 1954)
	April 5	Soap Lake, Grant County
	April 7	Lake Lenore, Grant County
Pied-billed Grebe	March 14	Sprague Lake, Lincoln County
	April 3	Potholes Area, Grant County
	April 4	Palm Lake, Adams County

Pied-billed, Western, and Red-necked Grebes usually appear in small flocks or as single individuals during spring migration. Most spring records for these species occur on or near known breeding areas and very little major movement is apparent.

Relatively large flocks of Eared Grebes, sometimes containing several Horned Grebes, usually occur on both breeding and non-breeding lakes during April. In late April and early May, either northward migration or dispersal to breeding areas usually results in a disappearance of Horned Grebes from these flocks. This is illustrated by the following data for West Medical Lake, Spokane County, for 1949:

Date	*Number of Horned Grebes*	*Number of Eared Grebes*
April 11	0	13
April 18	(mixed flock of 92 birds)	
April 25	(mixed flock of 108 birds, more Eared than Horned Grebes)	
May 2	10	43
May 9	0	85
May 16	0	105
May 23	0	73
May 30	0	113

Eared Grebes are generally well established on their breeding areas in May and begin nesting in June.

BREEDING

Relative Abundance

All five species of grebes are known to breed in Eastern Washington. The population counts of all summer resident grebes for the summers of 1949, 1950 and 1951 as shown below are indicative of the relative breeding abundance of these five species of grebes.

TABLE 2

RELATIVE ABUNDANCE OF GREBES OBSERVED ON BREEDING GROUNDS

Year	*Eared Grebe*	*Pied-billed Grebe*	*Western Grebe*	*Red-necked Grebe*	*Horned Grebe*
1949	950+	150	100	30	5
1950	1000+	250	100	15	10
1951	1500+	175	75	10	25

Known Breeding Locations

The Eared Grebe is the most abundant species in Eastern Washington and usually occurs in rather large breeding colonies consisting of 50 to

several hundred birds. Prior to the flooding of the Grand Coulee equalizing reservoir, the lakes of the Upper Grand Coulee in Grant County supported large colonies of Eared Grebes. Other known major nesting locations were Goose and Duley Lakes, Okanogan County; the Del Rio Potholes Area of Douglas County; Turnbull National Wildlife Refuge, Spokane County; Potholes in the Lamont Area of Whitman County; the Harry Harder Ranch Area of Adams County; and Twelve Mile Slough in Adams County. In addition to these major areas, broods or nests have been observed in small numbers on several other areas over the entire region (Fig. 1.).

The Pied-billed Grebe is the most widely and uniformly distributed species but is not as common as the Eared Grebe owing to its more

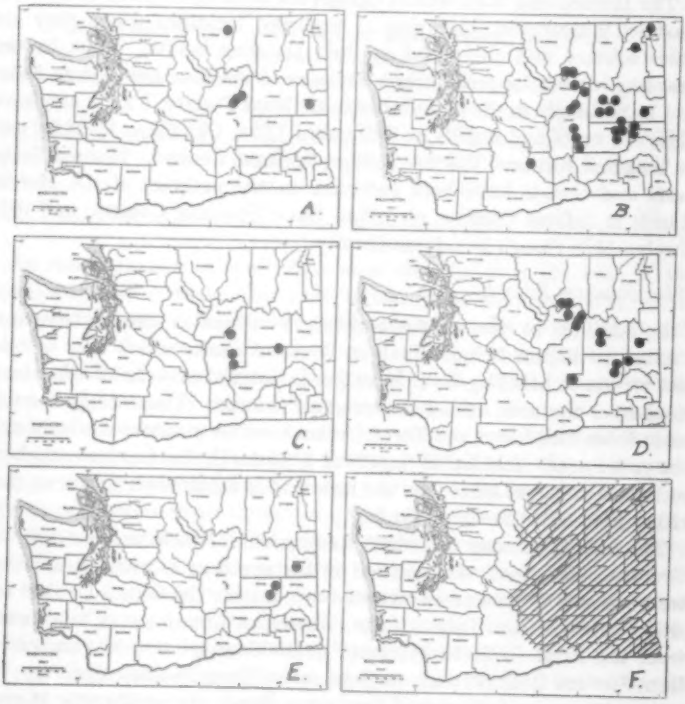

FIGURE 1. *A*, Known breeding areas for Red-necked Grebe; *B*, known breeding areas for Pied-billed Grebe; *C*, known breeding areas for Western Grebe; *D*, known breeding areas for Eared Grebe; *E*, known breeding areas for Horned Grebe; *F*, shaded area of eastern Washington under study during this investigation.

solitary social behavior. Broods and nests have been observed over the entire region during the summer. Major breeding areas were the P[illegible]-holes of Grant County (Harris and Yocom, 1952; Johnsgard, 1954); the Harry Harder Ranch Area, Adams County; Turnbull National Wildlife Refuge, Spokane County; the Lakes of the Grand Coulee, Grant County; the potholes of the Del Rio Area, Douglas County; the lakes of central Lincoln County; and Goose and Duley Lakes of Okanogan County.

The Western Grebe is the third most common breeding grebe in Eastern Washington and occurs in fewer, smaller, and less well defined colonies than the Eared Grebe. Sprague Lake, Lincoln County, and Moses Lake, Potholes Reservoir, and Lake Lenore, Grant County are known breeding locations.

The Horned and Red-necked Grebes are both uncommon breeders in Eastern Washington, occurring at scattered locations where they are quite solitary and anti-social in their breeding habits. Most known breeding records for Red-necked Grebe are from Blue Lake, Park Lake, and Lake Lenore in the Grand Coulee of Grant County, but we also have observed nests and broods at Wannakut Lake, Okanogan County; and at Turnbull National Wildlife Refuge, Spokane County. Horned Grebe nests and broods have been recorded on the potholes of the Harder Ranch in Adams County; on Alkali Lake, Spokane County; and near Twelve Mile Slough in Adams County.

Other Summer Records

In addition to the known breeding locations as listed above and located on Figure 1, individuals or flocks of adults which may or may not represent breeding birds have been observed in various other locations over the area during the summer months. These adult summer records for Pied-billed and Eared Grebes have been scattered widely over the entire area. Incidental records of Western Grebes have usually been restricted to larger lakes over the area and in much fewer locations than either Pied-billed or Eared Grebes.

The bulk of summer records of Red-necked Grebe have been from the Grand Coulee Area. In addition to the breeding records cited above, we have only five summer records from outside the Grand Coulee: one August record from Palmer Lake, Okanogan County; one June record from the Pend Orille River, Pend Orille County; two August records from Stevens County; and one June record from Spokane County.

In addition to known breeding areas listed previously, the Horned Grebe has been observed in summer at the following locations: three June records for the Potholes, Grant County; one June record, Soap Lake, Grant County; one June record, Lake Lenore, Grant County; one

June and one July record for the Harry Harder Ranch Area, Adams County; two July records for Turnbull National Wildlife Refuge, Spokane County; one July record for Ivy Lake, Lincoln County; one July record for Sullivan Lake, Lincoln County; and one August record for White Mud Lake, Stevens County.

Nest and Brood Data

Pied-billed Grebe.—The Pied-billed Grebe is the earliest nesting grebe in Eastern Washington. Most broods observed were classified into age classes as downy, 1/3, 1/2, 2/3, or 3/4 grown. The distribution of 90 broods so classified with respect to the time they were observed is shown in Table 3.

TABLE 3

AGE CLASSIFICATION OF PIED-BILLED GREBE BROODS OBSERVED IN EASTERN WASHINGTON

Age Class	*May*	1–15 *June*	16–30 *June*	1–15 *July*	16–31 *July*	*August*
1/3 or less.....	1	11	10	12	14	4
1/2 to 2/3.....	0	5	10	5	10	3
Over 2/3.....	0	2	0	1	1	1

An interpretation of these data must consider that the bulk of the observations were made after June 15 each year and that many young grebes 2/3 grown or older were probably not tallied due to confusion with adults. Our earliest record is one brood of four young about 1/3 grown in the Potholes Area, Grant County, May 26, 1951. Most records of broods less than 1/3 grown are for June and July. Because actual age equalivants for these size classes are unknown, it is impossible to calculate an exact peak period of hatching for the Pied-billed Grebe. However, it appears that hatching begins in early or mid-May and ends in mid or late August with a general peak in late June and early July.

Valid data on the size of broods for grebes are very difficult to obtain owing to the nature of the brooding habits of the birds. The authors feel that most observed brood sizes are minimal owing to the fact that some of the young in a brood possibly are not tallied. The *observed* sizes of 95 Pied-billed Grebe broods are shown in Table 4.

From these data it would seem that most Pied-billed Grebe broods average about three observable young per brood. However, actual sizes probably average slightly larger than this.

Broods of Pied-billed Grebes have been observed on waterbodies ranging from less than one-half acre to several hundred acres in size.

TABLE 4

SIZE OF PIED-BILLED GREBE BROODS OBSERVED

Observed Brood Size	*Number of broods in each age class*					
	Downy	*1 wk. to ⅓*	*⅓ to ⅔*	*⅔ to full grown*	*Undet.*	*Total*
1	3	3	7	0	0	13
2	3	7	15	3	3	31
3	7	10	5	1	4	27
4	1	3	3	1	1	9
5	4	2	2	0	0	8
6	0	3	1	0	3	7
Average Size	3.0	3.1	2.4	2.6	3.6	2.9

There is a definite tendency for the species to select permanent potholes and lakes where there is little danger of drought eliminating the water areas. In the Potholes Area of Grant County, 73 per cent of the "permanent" potholes tallied in late August at the end of hot weather and termination of recession of waterlevels were less than one-half acre in size whereas 25 per cent were between one and five acres in size (Harris, 1952). An even higher percentage of small potholes occurred at the beginning of hot weather in June. In this area, Pied-billed Grebes were not attracted to the very small potholes even though they were abundant and many appeared to fulfill the cover requirements for nesting of grebes. Only three per cent of the Pied-billed Grebe broods were found on potholes less than one-half acre in size; 80 percent occurred on potholes one to five acres in size; and 17 percent were on areas larger than five acres. Thus 97 percent of the grebes were nesting on 27 percent of the potholes. Observations on Pied-billed Grebes in other areas tend to corroborate these data.

In general, the waterbody used by breeding Pied-billed Grebes was one that supported stands of permanent perennial emergent vegetation, usually Viscid Bulrush (*Scirpus acutus*) or Cattail (*Typha latifolia*), and had areas of open water which apparently was preferred by the grebes over the vegetated areas for feeding and escape cover. In the Potholes Area, 53 percent of the broods were observed using open water as a feeding and escape cover area, 41 percent used *Scirpus acutus*, and six percent used Baltic Rush (*Jancus balticus*) (Harris, 1954).

Western Grebe.—In general, the Western Grebe is an early nesting species in Eastern Washington, although apparently not as early as the Pied-billed Grebe. We have records of courting birds for late April and early May. Nesting begins in early May or late April. The following

records for 1949 on Sprague Lake, Lincoln County, illustrate the chronology of the nesting season:

Date	*Number of Western Grebes*	*Activity*
March 31.....	5	First appearance
April 4.....	2	
April 11.....	2	
April 25.....	2 pr.	Both pairs courting
May 2.....	6	Nesting, saw birds on nest from shore
May 18.....	20	12 nests, see below

The nests of May 18th were in a colony at the south end of the lake. The nests were built on floating platforms of dead stems of Viscid Bulrush in over 30 inches of water. Five nests contained no eggs, two nests contained four eggs each, three contained three eggs each, one nest had three intact eggs and one broken egg, and one nest had one intact and two broken eggs. The broken eggs possibly were the result of predation by a colony of eleven pairs of Ring-billed Gulls (*Larus delawarensis*) which were nesting 300 yards away.

The eggs of the Western Grebes contained nearly full term embryos and it was estimated that they would have hatched within a few days. The eggs were resting in wet vegetation so that they were constantly moist. The nests were located on the fringe of a large bed of Viscid Bulrush adjacent to deep water.

Sprague Lake, which is typical of the known Western Grebe breeding areas of Eastern Washington, is a large lake with some shoreline vegetation and contains large populations of fish. Lawrence (1950) and Munro (1941) indicate that fishes are a major item of food for Western Grebes.

The creation of a large artificial lake behind O'Sullivan Dam in the Potholes Area of Grant County has afforded an unusual opportunity to observe the rate of occupancy of a new habitat by Western Grebes. In the spring of 1950 about 600 surface acres of water were impounded behind the newly completed dam. After the heavy spring run-off was completed, this lake was allowed to recede to about 300 acres in size. It was held at approximately this level during the summers of 1950 and 1951. The nearest area occupied regularly by Western Grebes prior to the creation of Potholes Reservoir was Moses Lake, 10 miles to the north across shifting sand dunes. Moses Lake has long been noted as a breeding area for Western Grebes.

In early June of 1950, there were 15 Western Grebes on the Potholes Reservoir. Although no nests or broods were observed in either 1950 or 1951, there was a regular population of ten to fifteen birds on the lake all summer both years and courting occasionally was observed in May.

It is possible that broods could have escaped detection on the large lake although very little emergent vegetation was present during these years.

In the spring of 1952, the impoundment of the entire area began and was very far progressed in 1953 and 1954 when several square miles had been inundated. During the summer of 1953, the resident population had increased to at least 52 birds and the species was known to breed in 1953 and 1954 (Johnsgard, 1954).

Eared Grebe.—The Eared Grebe is typically a late nester in Eastern Washington and usually the hatching period extends from mid-June to August. From the data available, it appears that the earliest nesting begins in mid-May and the bulk of the nests are started near the first of June. Eared Grebe broods were classified into downy, ¼, ⅓, and ½ grown size classes when observed in the field. The following distribution of more than 94 young grebes (not broods) by size class and dates ob-

TABLE 5

YOUNG EARED GREBES OBSERVED IN EASTERN WASHINGTON

Age Class	*Number of Young Observed*			
	June 16–30	*July 1–15*	*July 16–31*	*August*
Downy	3	4	7	0
¼ to ⅓ grown	0	14	37+ many*	7
½ grown	0	0	18+ many*	4

* The term "many" indicates the size classes of young observed in very large colonies involving hundreds of adults and young where it was impossible to tally the relative numbers of young of different size classes.

served indicate the general late hatching for Eared Grebes compared to similar data for the Pied-billed Grebes listed previously. These data would indicate that the bulk of the Eared Grebes hatch in July in Eastern Washington.

We have been unable to obtain reliable data on brood sizes of Eared Grebes owing to their colonial nesting habits, which make it impossible to separate individual broods in most instances, and because many adults are still nesting while others are attending young. General observations usually have indicated about one young per adult in most colonies in late July when most young were afloat. However the average clutch size appears to be four eggs.

Large colonies of Eared Grebes usually are found on relatively large waterbodies. Although the species does breed occasionally on quite small lakes and potholes, the number of adults concerned on these smaller areas nearly always is small. The approximate numbers of adult birds contained in colonies on representative large and small waterbodies illustrate this fact (Table 6). Even on the large lakes where a large

TABLE 6

ADULT EARED GREBES IN BREEDING COLONIES IN EASTERN WASHINGTON

Large Areas		
Area	*Year*	*No. Adults Counted*
Twelve Mile Slough	1949	145+
Twelve Mile Slough	1950	100+
Turnbull Refuge (Upper Turnbull Lake)	1948	200+
Turnbull Refuge (Upper Turnbull Lake)	1949	66+
Turnbull Refuge (Upper Turnbull Lake)	1950	115+
Goose Lake, Okanogan County	1949	200+
Upper Grand Coulee:		
Devil's Lake	1949	105+
Tule Lake	1950	200+
Steamboat Marsh	1950	75+
Small Areas		
Area	*Year*	*No. Adults Counted*
Alkali Flat—Ewan	1949	2
20 Acre Lake, Lamont	1949	31
20 Acre Lake, Lamont	1950	22
8 Acre Lake, Lamont	1950	14
5 Acre Pothole, Del Rio	1950	18+
12 Acre Pothole, Del Rio	1950	14
Small Roadside Pothole Near Benge, Adams County	1950	15+
½ Acre Bay, Small Pothole Near Twelve Mile Slough	1950	25+

number of grebes collected in one breeding colony, the actual nesting area often was quite restricted in size, with all the nests for the colony contained in only a few acres of emergent vegetation. An example of this situation is illustrated by the fact that in July of 1949 on Twelve Mile Slough, Adams County, 70 nests representing a colony of 145+ adults were concentrated into an area about 100 yards from shore.

Nests that we have observed usually have been located in short emergent cover of the spike rush type. Of four small colonies where cover types were noted in 1950, two colonies were located in *Scripus americanus* (Del Rio Pothole Area, Douglas County); one was in Creeping Spike Rush (*Eleocharis macrostachya*) (Benge, Adams County); and one was in Baltic Rush (*Juncus balticus*) (near Twelve Mile Slough, Adams County).

On July 2, 1953, a large colony of Eared Grebes nesting at Turnbull National Wildlife Refuge, Cheney, Washington, were inspected by Yocom. Fifty nests were seen in a relatively small area in clumps

of Viscid Bulrush; most of the nests had from three to five eggs per clutch. The floating nest platforms were masses of vegetation consisting entirely of Green Milfoil (*Myriophyllum verticillatum*). A Pied-billed Grebe nest found in the same lake was a larger mass of floating vegetation made of Viscid Bulrush. Two eggs were in this nest.

The first Eared Grebes known to nest at Turnbull National Wildlife Refuge after it was created consisted of four pairs that nested in 1944. By 1948 the colony had increased to the size where John Parrish estimated that about 400 nests were located on Upper and Lower Turnbull lakes. The nests that he observed had from two to six eggs per clutch, and averaged about four eggs per nest. On July 19, the first eggs were known to have hatched; nests continued to hatch as late as mid-August.

FALL MIGRATION

We have been able to obtain little reliable data concerning the fall migration of grebes in Eastern Washington. In general fall migration is seen as a gradual disappearance from breeding areas during September, October, and November. After mid-November, very few grebes are observed in Eastern Washington and by early December what few remain can be considered as wintering birds.

Some of the later fall dates and the localities are as follows:

Species	*Latest Date*	*Locality*
Western Grebe	November 28	Sprague Lake, Lincoln County
	November 28	Snake River, Almota, Whitman County
	December 4	O'Sullivan Dam, Grant County (Johnsgard, 1954)
Red-necked Grebe	October 24	Blue and Park lakes, Grant County
Horned Grebe	November 5	Potholes, Grant County
	November 7	Sprague Lake, Lincoln County
Eared Grebe	November 22	Lake Lenore, Grant County (3000+ birds)
	November 31	Sprague Lake, Lincoln County

It is impossible to list departure dates for the Pied-billed Grebe since we have a scattering of records for all months of the year.

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OBSERVATIONS ON THE INCUBATION BEHAVIOR OF A COMMON NIGHTHAWK

BY MILTON W. WELLER

Although the Common Nighthawk (*Chordeiles minor*) has been studied extensively, certain phases of its breeding biology have been considered only superficially. Among these are the incubation movements of the female, the manner in which eggs are moved, and certain activities of the male. An opportunity to investigate this behavior presented itself when a Nighthawk nested on the graveled roof of the Wildlife Building of the University of Missouri in 1957. I am indebted to Thomas S. Baskett, William J. Hamilton III, Frank McKinney, and Margaret M. Nice for assistance with the manuscript.

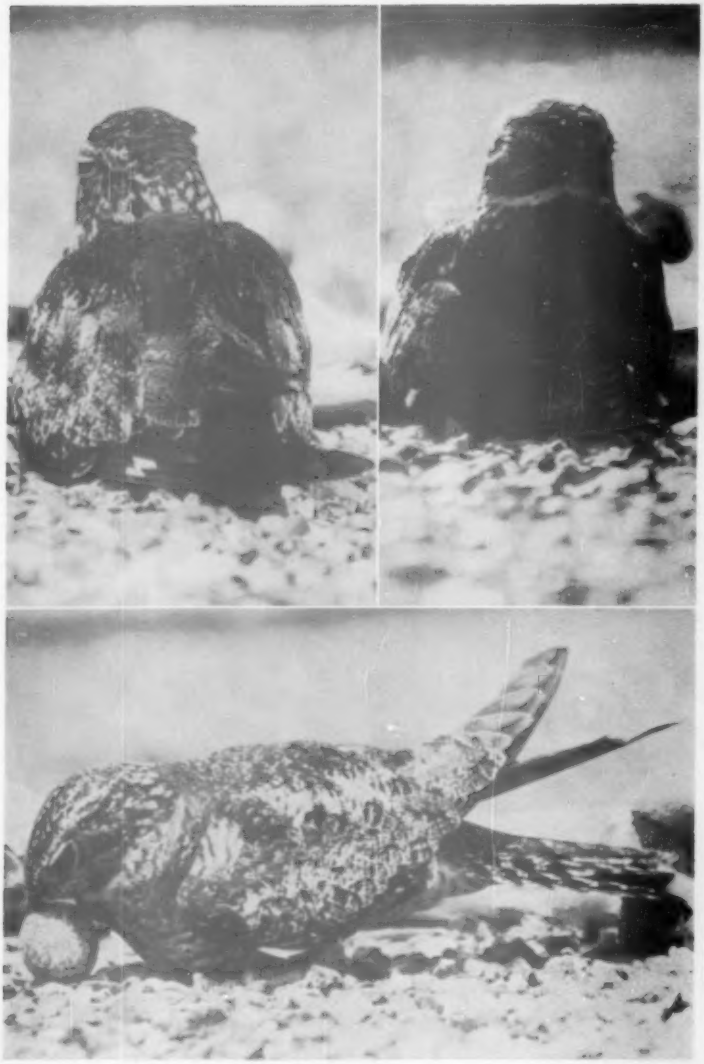
Orientation to the Sun

The incubation movements of the European Nightjar (*Caprimulgus europaeus*) have been studied in detail in a captive bird by Heinroth (1909). Lack (1932) states that Heinroth (1928: 279) reported both the Nightjar and the Sand Grouse (*Pterocles* spp.) usually facing the sun during incubation. Shadow thus was reduced to a minimum and the effectiveness of the bird's camouflaging plumage maintained. Lack (1932), however, found that less than half the female Nightjars he observed faced the sun. Few workers in North America seem to have considered orientation behavior in the Nighthawk; but Gross (1940: 214) observed that a Nighthawk he watched "usually faced the sunrise in the morning and the sunset in the evening."

In the present study, this orientation was measured more precisely by means of a sun dial constructed by mounting a vertical rod in the center of a board marked with a circle scaled in 10° intervals. This was placed near the roof door from which observations were made. Most observations were made at hourly intervals. The direction of the sunlight was determined by the shadow of the rod of the sun dial and the position of the bird's axis was estimated in degrees by reference to the dial.

These observations are summarized for one complete day in Figure 1. Remarkably precise agreement is shown between the bird's position and the angle of the sun. The bird maintained the sun at her back throughout the day.

At only one observation was a conspicuous disagreement noted between the bird's long axis and the angle of the sun. This occurred at 9 a.m. during a partly cloudy period. By 10 a.m., when the temperature at roof level reached approximately 110° F (43° C), the bird had not only moved



Common Nighthawk. (A. *Left*) Showing position of wings and ruffling of head and back feathers. (B. *Right*) Shading first egg of second clutch. (C. *Below*) Poking displaced egg under her. Photos. by M. W. Weller.

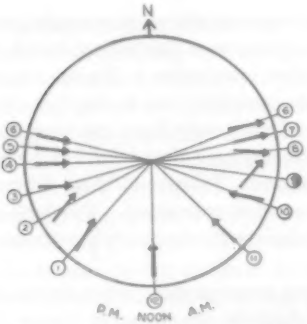


FIGURE 1. Orientation of an incubating Nighthawk to the sun. The position of the bird is shown by the arrow. Time of day and position of the sun are shown by the small circles. Clear circles indicate bright sun; half-black circles indicate partly cloudy conditions.

to a new position in line with the sun, but had reversed so that its head faced away from the sun's rays. A similar pattern is shown by several observations on another bright day (Figure 2). On this day, the bird was forced to leave its nest on two occasions: At 11 a.m. the bird was sitting with the sun at her back. After being flushed, she returned facing the sun but still well oriented to its rays. At 2 p.m., she was flushed again and on her return, oriented perfectly and in the same position as before leaving the nest. In the latter situation, she could easily see the observer and still have the sun at her back, while in the morning she apparently turned to watch the investigator. She maintained a position with the sun at her back throughout the remainder of the day.

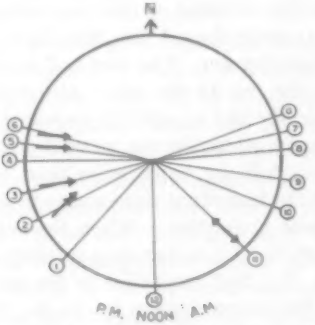


FIGURE 2. Seven observations of the Nighthawk's orientation to the sun on another bright day.

The observations described above were made during the first week in June. During the incubation of the second clutch during the first week in July, it was noted that orientation to the sun was poor between 11 a.m. and 2 p.m. This was probably due to the fact that the sun was more nearly overhead than during early June and its rays were less directional. Either the bird could not recognize or did not respond to such slight differences in sun position. Moreover, these differences would be insignificant as far as shadow is concerned. The lack of orientation during this period may explain in part why this phenomenon has not been widely recognized.

Observations for an overcast day, when the position of the sun was not apparent to the observer, are shown in Figure 3. It is apparent that

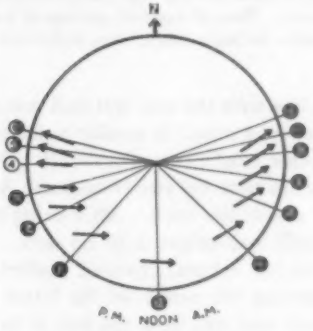


FIGURE 3. Positions of the Nighthawk in relation to the theoretical position of the sun on an overcast day.

no orientation to the sun occurred on that day until between 3 p.m. and 4 p.m. when the sky partly cleared. At that time the bird reversed its position and faced into the sun. The bird had moved again by 5 p.m., and remained there the rest of the day. Although observations were made only every hour, the bird apparently remained in the same position for as long as four hours when the sun was not shining. On the bright days, no position was held for much more than an hour. There was some indication that the bird sat at right angles to the sun on hazy days, perhaps to aid in heat absorption. When the sun appeared on cool, cloudy, days, the bird faced it rather than turning away from it.

Without question, the bird responded to the sun on clear days but did not orient when the sun was hidden by clouds. Then, artificial shade was provided. The bird was kept in the shade from 8 a.m. until 12 noon; the result of this shade on movements is shown in Figure 4. Although

minor movements occurred, her orientation was definitely impaired by the shade. Thus Lack's observation (1932) that not all Nightjars oriented to the sun was probably a result of the presence of shade.

Conceivably, orientation to the sun would not only aid in protection from aerial predators but would cause an even distribution of heat over the body and might reduce the body area exposed to the sun. Thus heat, as well as light, could act as a stimulus for orientation. On the day shade tests were conducted, temperatures at roof level ranged from 92° F (33° C) at 8 a.m. to 126° F (52° C) at 12 noon. In spite of the fact that the heat under the shade was nearly as great as in the open sun, no orientation occurred. However, the effect of this shade on body tem-

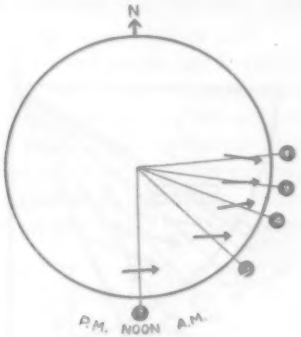


FIGURE 4. Position of the Nighthawk in relation to the sun when the bird was artificially shaded.

perature was unknown. Thus, light seemed of greater importance in orientation than heat.

Then, partial shading tests were conducted in an effort to determine the body area most influenced by the sun. First, the Nighthawk's head was exposed while her body was shaded. She immediately began panting, indicating a greater body heat, and within two minutes had moved nearly 60° from a position at a right angle to the sun to within 30° of the axis of the sun's rays. She remained in this position for 35 minutes and then the shade was moved to cover her head. She did not move for an hour and twenty minutes. When she finally moved, it was probably due to the hatching of one of the young rather than to the position of the sun. She took a position within 30° of the sun's axis but with her head still shaded. Shortly afterwards, her head was uncovered and her body shaded. She immediately moved to a new position, also within 30° of the sun's angle but reversed, and with her head in the shade! Shading exper-

iments were then discontinued. Apparently, the head was of more importance than the body in inducing orientation.

After the young hatched, the female moved them around on the roof to utilize shade available from pipes and other structures on the roof. There was some evidence that the young oriented to the sun when only seven and eight days of age, but because they spent most of their time in the shade, their ability to orient to the light could not be accurately determined. The female oriented to the sun in spite of the fact that she provided less shade for the young.

It would seem that sun orientation in the Nighthawk may well have resulted from the tendency of a nocturnal bird to avoid glaring light. However, more detailed information is necessary on the Nightjar, and

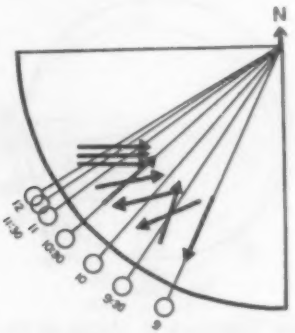


FIGURE 5. Position of the Nighthawk in relation to the position of the moon.

especially on diurnal birds which nest in the open, such as the Sand Grouse.

Shortly after sunset each evening, the female left the eggs or young for a short feeding flight, staying away 20 minutes on one night and 17 minutes on another. When she returned, her orientation was not toward the glow of the western sky. The presence of the moon, and its probable importance in the reproductive cycle (Wynne-Edwards, 1930), suggested a possible orientation to that light source. Such orientation would reduce shadows as does orientation to the sun. Observations were made of the bird's position in relation to the moon on two nights. These observations were of short duration due to cloudy conditions and the influence of the more mobile young under the Nighthawk. The data are summarized in Figure 5 and show no very strong orientation to the moon. Efforts to orientate the female with a strong flashlight failed.

COOLING MECHANISMS

Because heat is dissipated by panting (Cowles and Dawson, 1951), shading of the mouth region by orienting away from the sun may aid in cooling. Orientation to the sun also may aid in cooling the Nighthawk by reducing the amount of surface exposed to the sun. When the female was in the open sun, and facing away from it, panting started when roof temperatures reached 95° F (35° C).

An additional cooling mechanism was the ruffling of the back and head feathers (Plate 5A) which created shaded air spaces (see Morris, 1956). This started in the open sun when roof temperatures were between 103° F (39° C) and 112° F (44° C), depending on the amount of the breeze. At the same time, the primaries were often lowered below the tail, forming a shading canopy (Plate 5A).

The female's cooling devices permit her to survive in spite of temperatures of up to 142° F (61° C), as recorded once during this study. Moreover, the female seems to be in a lethargic state most of the day. For about 15 minutes prior to leaving the nest in the evening, she goes through a "waking" period. She opens her eyes wide frequently, moves her lower mandible, gapes once, watches the activities of the male and other birds flying by, and then leaves (with or without the presence of the

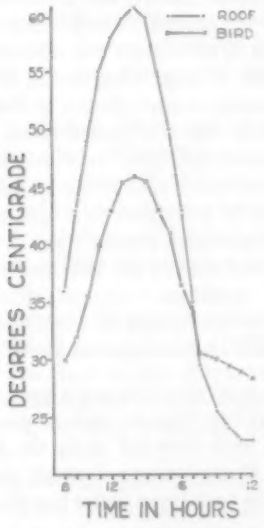


FIGURE 6. Temperature of the nest site when covered by the bird compared with the temperature of the open roof from 8 A.M. until Midnight.

male). Her influence on the cooling of eggs during the summer heat is probably of greater importance than heating them during cool periods. To measure grossly the influence of the hen's body on the temperature of the area under the eggs, a thermometer was placed upside-down, through the roof, with the bulb just under the eggs. Another thermometer was placed in the roof in a like manner but with the bulb of the thermometer exposed to the sun. The results of one day's records (8 a.m. to midnight) are shown in Figure 6. During the heat of the day, the presence of the bird lowered the temperature of the nest site as much as 15° C. The opposite was true at night, when the presence of the female increased the nest temperature by five to six degrees Centigrade. The rapid decline in temperature of the nest from five until nine p.m. was due to the fact that the female had moved the eggs slightly and was not directly on the thermometer.

Movement of Eggs and Young

Another problem of interest raised by several investigators is how eggs are moved by the Nighthawk. It is commonly believed that members of the Caprimulgidae move eggs in their mouths when the nest is disturbed (Armstrong, 1947: 35). However, there seem to be no authentic records of such movements. Sutton and Spencer (1949) noted that the eggs of a Nighthawk were moved 28 inches when the old nest site was flooded but the method of movement was unknown. Gross (1940: 213) stated that two clutches of eggs were moved five and six feet by the females, but this movement was attributed to the female's habit of poking eggs under her when she approached them. Because she usually approached from the same direction, the movement of eggs occurred in a rather straight line and left a trail in the gravel. Warren (1890: 181) recorded the movement of a Nighthawk's eggs a distance of 200 yards and implied that the Nighthawk carried them in her mouth. However, he did not see this act and did not say how he identified the eggs of that particular individual. Audubon (1831: 275–276) said that both eggs and young are moved in this fashion by the Chuck-will's-widow (*Caprimulgus carolinensis*). He also commented that:

> "... The Negroes, some of whom pay a good deal of attention to the habits of birds and quadrupeds, assured me that these birds push the eggs or young with their bill along the ground. Some farmers without troubling themselves much about the matter, imagined the transportation to be performed under the wings of the old bird."

Rysgaard (1944) and Kilham (1957) observed a Chuck-will's-widow and a Whip-poor-will (*Caprimulgus vociferus*), respectively, carrying eggs

by use of their feet. The former case was clearly accidental but the nature of the latter is uncertain.

In the present study, one of the two eggs was displaced from the nest site to determine how eggs were transported as well as to study incubation movements. When the egg was moved one inch from the original nest site, the female first straddled the egg in the original site and poked the displaced egg under her with the lower mandible (Plate 5C), a movement characteristic of many birds (Poulsen, 1953). After the egg was displaced four inches, the bird again returned to the nest site and covered the remaining egg. Then she rose slightly, and walked a few inches toward the displaced egg, apparently pushing the other egg in front of her feet, until she could reach the displaced egg. This she immediately poked under her. Next, the egg was displaced 12 inches, far beyond where she could poke an egg into the nest site. She took a position between the two eggs, and after a period of hesitation, went back to the original nest site. After a few seconds, she left the egg in the nest, moved toward the second egg, and poked it under her as if to brood. Simultaneously, she turned toward the nest. She then walked slowly toward the first egg, apparently rolling the displaced egg in front of her feet. However, the egg was partly hidden by the breast feathers. The egg was moved about seven inches in this fashion and then the female moved off the egg and toward the egg at the nest site, which she poked under her. Then she turned and poked under her the egg which she had rolled. Finally, she covered both eggs, and the nest was moved only two or three inches toward the displaced egg.

When the female incubated her second clutch, experiments with moving an egg were again tried. When the egg was moved 12 inches, the female returned to her nest, remained two minutes, and then moved to the displaced egg. She poked the egg under her and moved sideways for a distance of eight inches, rolling, at times holding, the egg with her flank and breast feathers. Then she returned to her nest and poked in the retrieved egg.

When the egg was moved three feet from her, she did not attempt to retrieve it. Gross (1940: 213) and Parks (1947) also noted a stronger attraction to the nest site than to eggs displaced several feet from the nest. After 45 minutes, the egg was moved within 12 inches of her. She immediately retrieved it, holding it mainly by means of her breast feathers and her legs.

The manner in which the young were moved was observed early one morning when one young had hatched and was less than one day old. At 7:30 a.m., the adult was found incubating her young within three feet of the roof door in the shade, about 10 feet from the remaining egg at the

nest site. After being flushed by the investigator, she walked to the remaining egg, sat on it, and in a few seconds returned to the young and brooded it within three feet of the observer's head. Then she left the young, and moved toward the nest, giving a low nasal "kurr" or "kra" call at a rate of about one per second. The young followed her, resting periodically, until they reached the nest site.

OTHER INCUBATION BEHAVIOR

During the 45 minutes when only one egg was present in the nest, several movements were observed which were not seen during normal incubation of two eggs. When returning to the single egg, she poked it under one side of her brood patch. Then she poked toward the other side of her breast feathers as if she noted the absence of the second egg. She rotated on the nest, often completely disoriented to the sun, and poked "falsely" at the missing egg. Occasionally she pecked at a piece of gravel instead of completing the poke. Once she left the nest in a direction opposite to the displaced egg but returned immediately. It appeared impossible for her to incubate comfortably on one egg, and possibly this fact alone causes her to shade her first egg but not to incubate it until the second is laid (Plate 5B).

Once, after the female was chased off the nest three times in two hours, she hesitated to return. She stopped a foot from the nest and preened both her breast and her scapulars before she incubated the eggs. This was not observed on any other occasion and may well have been a displacement activity.

Another activity, which was probably a displacement movement, occurred on the first evening that incubation of the second clutch started. The second egg had been added at 10:30–11:30 a.m. after an interval of at least one full day. The female started incubation immediately and that evening left the nest about 15 minutes later than in the two previous nights when she was not incubating. The male landed by her, and called a low nasal "nar-r, nar-r" and the hen responded with a gutteral "kra-a" but did not leave the nest. Soon, she preened under her left scapulars 14 times in rapid succession. This action, which was not witnessed under any other circumstances, may have represented precopulatory behavior. (Copulation during the incubation period has not been reported for the Nighthawk, but was observed in the Nightjar by Lack, 1932.) Following this activity, the male left but the female did not follow until five minutes later. After 32 minutes, she returned to the eggs and remained there. On the previous two evenings, before completion of the clutch, she did not remain near the eggs at night.

No other incubation movements were observed; all nest building

motions being absent or at least not stimulated under the observed conditions.

BEHAVIOR OF THE MALE

Numerous investigators have observed that the male Nighthawk usually roosts a short distance from the female in a tree or on a building. Calling by the male on leaving the roost in the evening indicated that his roost was in a tree within 25 yards of the nest. This calling seemed to arouse other males in the area. Territoriality of the male Nightjar has been described by Lack (1932). In the present study no observations were made during the period of pair formation and establishment of territory, but the territory of the male Nighthawk seemed well defined and clearly outlined by his flight pattern during the hen's period of incubation. He repeatedly utilized the same area in his feeding flights and returned to "boom" near the female on the nest. Another male frequented an adjacent area, and some chasing occurred when either male strayed into the other's territory. One active chase was noted when the adjacent male dived to the nest-site as the owner visited his female.

During the period between the first and second clutches, which presumably was fairly well timed with activities of other females in the area, a larger number of Nighthawks were seen in the territory. Often pairs or triples were observed in chases when both the members of the territorial pair were accounted for. When such birds passed close to the male, he often joined the chase but his actions were never clearly observed. When other birds were high in the sky or at the edge of his territory, the male seemed uninterested.

"Booming" of the male was usually, but not always, restricted to the area of the nest. On two occasions, the number of dives made by the male from the time he left his roost to the time he visited the female was counted. On one evening he performed 32 dives in 40 minutes, and on another, 39 dives in 34 minutes, averaging one dive per minute for the two nights. Shallow dives were often performed away from the nest-site and in some cases, seemed more common at the imaginary boundary of the territory. When the young was able to fly, the male was observed on several occasions to dive at it.

While "booming" may be chiefly aggressive behavior, and occasionally seemed to be directed at intruders in view of the male, a more intense display was witnessed when the investigator was examining the eggs during the female's "off" period. The male approached the building and circled within 20 feet of the investigator, flying with a "wing-clapping" stroke and calling intensely and rapidly: "cho-ic" or "che-wip". The male landed on a nearby roof and made the same call in a milder tone,

until the investigator left. The male flew from the roof with the "cho-ic" call, which soon changed to the usual "peent" call.

Although it has been stated occasionally that the male *Chordeiles minor* assists in incubation, workers who have made detailed observations have not witnessed this (Bowles, 1921; Gross, 1940; Tomkins, 1942; Rust, 1947; Sutton and Spencer, 1949; and Dexter, 1952). In the present case, the male visited the female in late evening. On alighting, he called with a nasal "narr"; the female responded with a rasping "kra-a", or "kra-p." The female immediately took flight and the male soon followed her and did not attempt incubation. This was possibly the result of the investigator's presence, but the male showed few signs of broodiness. The male was seen to feed the young when they were less than a day old, and the surviving young after it fledged. After the first egg of the second clutch was laid, the male fed the young much more often than did the female. The female tolerated the young on the nest with her and was never seen to chase it, but her tendency not to feed the juvenile undoubtedly prevents the latter from molesting the female by "begging" for food while she is incubating. In feeding, the male seemed to "tease" the young by landing and quickly taking flight. When the male flew near the roof on which the juvenile was perched, the latter became very excited, peeped, raised its wings, and ran toward the passing male. The bird did not react to the female in this way, although it sometimes peeped and pecked at her bill. The call of the male seemed most important as a signal to the young of the male's approach. When the young Nighthawk was 28–29 days old, it often chased the male. Also at this age, while perched on the roof awaiting the male, the juvenile flew up and captured insects. These flights became longer as the young matured.

SUMMARY

A study of the incubation behavior of the female Nighthawk was conducted on an exposed nest located on a roof. It was found that on clear days the female oriented her body along the axis of the sun's rays with her head away from the sun. On cloudy days, or when artificially shaded, she did not orient. Her head was more sensitive to the sun than her body and was of greatest importance in maintaining orientation.

Cooling devices of the Nighthawk include panting, facing away from the sun, and fluffing the feathers. The presence of the female cooled the eggs as much as 15° C on a warm day and warmed them as much as six degrees at night.

Movement of eggs and young by the Nighthawk was observed. Movement of eggs was accomplished by means of the bill, feet, and breast

feathers, while young were capable of self-locomotion in response to the female's call during their first day after hatching.

The male assumed responsibility for feeding the young of the first brood while the female incubated the second clutch. Behavior and the early flights of the juvenile are described.

This is a contribution from the Missouri Cooperative Wildlife Research Unit: U. S. Fish and Wildlife Service, Wildlife Management Institute, Missouri Conservation Commission, Edward K. Love Foundation and the University of Missouri cooperating.

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RELATION OF "CLUTCH-SIZE" TO NUMBER OF OVA OVULATED BY STARLINGS

BY DAVID E. DAVIS

THE CLUTCH SIZE of birds has been widely used as a measure of biological processes. The data can be obtained without killing the bird or performing any technical manipulation. However, the relation of the number of eggs actually ovulated to the number in the nest has not been examined except incidentally. The purpose of this contribution is to compare the number of eggs ovulated by Starlings (*Sturnus vulgaris*) with the number in the nest box. Problems of interpretation of clutch size will be discussed.

"Clutch" to an ornithologist means the number of eggs in a nest that are being incubated. It is generally assumed that the loss of eggs from accidents or predation is negligible and that the number in a clutch is essentially the same as the number ovulated. Yet, it has been known for a long time that eggs are occasionally found on the ground. Some species such as Rheas (*Rhea americana*) commonly scatter eggs for a week or so before starting to lay in a nest. Others such as ducks lay eggs in nests of other ducks or even pheasants. Pheasants (Kabat et al. 1948) have been shown to lay only part of their eggs in a nest. Among passerine birds the number of eggs lost has been considered to be negligible and the clutch size has been assumed to be a good measure of the egg production, although Davis (1955a:274) raised some doubts.

Interest in this problem arose from an attempt to determine whether Starlings are determinate or indeterminate layers. Davis (1955b) had shown that the clutch size for Barn Swallows and Magpies was no more or no less than normal when eggs were removed from or when eggs were added to the nests. Experiments of this type were begun on Starlings in 1953 and it was soon suspected that the number of eggs in the nest might not be a good measure of the effect of removing or adding eggs. Comparison was then made with the number of eggs ovulated; as determined by counting the number of post-ovulatory follicles.

METHODS

The work was conducted on the forested grounds of a hospital near Baltimore. Some 60 nest boxes (18 x 6 x 6 inches) were nailed to trees high enough to be accessible only by a ladder. The contents of the boxes were observed sufficiently frequently (daily during laying) to determine the date on which eggs appeared in the box. Some nests were not disturbed, other nests had 4 eggs added when the first egg appeared and

others had eggs removed as laid (see Davis 1955b for more details of procedure).

After the laying stopped, the female was captured on the nest. Birds were obtained at various stages of incubation and even a few days after the young hatched. The birds were caught during the day if possible, but some wary individuals had to be caught at night. The bird was killed in the laboratory and the entire ovary fixed in Bouin's solution. The ovaries from 1953-56 were all prepared histologically in 1956. The ovary was stained *in toto* in alumcochineal, sectioned serially, placed on large slides, and covered. The number of post-ovulatory follicles (POF) in each ovary was counted.

Recognition of post-ovulatory follicles: Some years ago in determing the number of eggs laid by certain cuckoos, through sectioning the ovary and counting the post-ovulatory follicles (Davis 1942a, 1942b), the confusingly similar appearance of burst atretic follicles was discovered (Davis 1942c). The bursting of atretic follicles presumably serves to remove large quantities of yolk material in large ova that undergo atresia. The granulosal and thecal layers of the follicle break, permitting the yolk to flow out of the follicle. However, the mesothelium of the ovary does not break so that the yolk is kept within the ovary. The burst atretic follicle (BAF) superficially resembles a post-ovulatory follicle (POF), but can be distinguished by lack of a break in the mesothelium and (usually) presence of yolk or yolk residue either in the follicle or around the outside. Also the BAF is circular rather than elliptical. These differences remain clear for many days and confusion could result only in the case of greatly regressed follicles. No confusion is likely for birds that are incubating or feeding young. It is possible to distinguish the age of various groups of follicles and Davis (1942d) showed that cowbirds ovulated several groups ("clutches") of eggs.

Definition of clutch: "Clutch" to a poultry worker (unlike the usage among ornithologists) is the number of eggs laid consecutively in a daily series. The "clutch" for the Domestic Fowl thus may be as small as 2. The term "cycle" is apparently used to refer to the length (in days) of the interval between days without laying, and does not refer to the number of eggs. Thus Heywang (1938) listed the eggs per cycle (clutch) and the number of such cycles; he reported that in his flock about half the hens had cycles of two days. For the rest of this paper, clutch will mean the number of eggs found in a nest. This pragmatic definition conforms to current ornithological usage and has the merit of being an item of data that can readily be obtained.

A problem arises in the assignment of the date of laying. The boxes were examined after 9 A.M. to give the birds time to lay before checking. However, in some cases an egg was surely laid after examination of the box and thus erroneously credited to the succeeding day. Actually, the true date of laying is not essential.

RESULTS

The number of post-ovulatory follicles and the number of eggs in the nest-box are given in table 1, as well as other pertinent data. It is

TABLE 1

DETAILED RECORDS OF CLUTCHES AND POST-OVULATORY FOLLICLES

Bird	*Year*	*Dates eggs laid*	*Clutch*	*Follicles*		*Date collected*	*Treatment*
				I	*II*		
986	1954	April 23, 26	2	5	2	April 29	Add
988	1954	Before April 20	5	6	—	April 24	Normal
989	1954	Before April 22	6	4	—	May 4	Normal
990	1954	Before April 20	5	4	—	May 4	Normal
992	1954	Before April 21	4	0	1	May 4	Normal
996	1954	May, 7, 8, 9, 10, 11	5	7	—	May 18	Subtract
1000	1954	Before May 24	3	4	—	June 9	—
1003	1955	April 15, 16, 17, 19	4	4	—	April 25	Subtract
1004	1955	April 17, 18, 19, 20	4	5	—	April 25	Add
1005	1955	April 12, 13, 14, 15, 16	5	5	—	April 25	Normal
1007	1955	April 18, 19, 20, 21, 22	5	2	5*	April 25	Subtract
1008	1955	April 15, 16, 17, 18, 19	5	5	—	April 25	Subtract
1009	1955	April 16, 17, 18, 19, 20	5	7	—	April 25	Normal
1012	1955	April 16	1	4	—	April 26	Add
1020	1955	April 15, 17, 18, 19	4	4	—	April 26	Subtract
1021	1955	April 17, 18, 19, 20	4	5	—	April 26	Add
1023	1955	April 15, 16, 17, 18, 19	5	3	—	April 26	Subtract
1024	1955	April 17, 18, 19, 20	4	6	—	April 26	Subtract
1025	1955	April 17, 20	2	4	—	April 26	Add
1026	1955	April 14, 15, 16, 17, 18, 19	6	6	—	April 26	Subtract
1027	1955	April 19, 21, 22, 23	4	5	3	April 26	Add
1037	1955	April 22, 23, 24, 25	4	5	4	April 29	Add
1038	1955	Before May 11	4	5	5	May 11	—
1040	1955	Before April 29	6	4	—	May 11	Normal
1052	1955	May 28	1	4	6	May 30	—
1053	1956	Before May 9	3	5	—	May 9	—
1054	1956	Not known	6	6	—	April 27	—
1055	1956	Not known	7	6	—	May 25	—
1056	1956	May 2, 3, 4, 5	4	4	—	June 3	—
6421	1954	Before May 24	4	0	5	June 10	—
4053	1954	Before June 9	3	1	5*	June 9	—
4486	1954	Before April 26	4	6	—	April 18	—

I Refers to recent follicles.

II Refers to an older group.

*These 2 birds also had 7 very old follicles.

apparent that some serious discrepancies occur between the clutch size and the number of post-ovulatory follicles. Among the 32 birds, clutch size and the number of POF are the same in only 7 cases. In 9 cases the clutch is larger and in 16 cases the clutch is smaller than the number of POF.

Consider some specific cases. Bird 996 had 7 POF but had only 5 eggs

in the box. These 5 eggs were laid in a daily sequence that would not arouse suspicion concerning interruptions. Based on the extent of regression of the POF, it seems likely that the missing eggs were dropped before the date (May 7) the first egg was laid in the box. Bird 1012 had only 1 egg in the nest but ovulated 4. Bird 1023 had 5 eggs in the nest but ovulated only 3. Bird 992 was feeding 4 young when caught in the box but had no POF in the ovary.

Actually in table 1 the eggs ovulated averages 4.38 which is almost the same as the clutch size of 4.22 because the gains from several birds laying in a nest cancel the losses of eggs.

The differences between clutch size and number of POF may result from several causes. Unfortunately, it seems difficult to assign a cause

TABLE 2

COMPARISON OF EGGS OVULATED AND CLUTCH SIZE (FIRST CLUTCHES)

POF or eggs	*Normal nests*		*Addition nests*		*Subtraction nests*		*Total nests*	
	Ovulated	*Clutch*	*Ovulated*	*Clutch*	*Ovulated*	*Clutch*	*Ovulated*	*Clutch*
1	0	0	0	1	0	0	0	1
2	0	1	0	1	1	0	1	2
3	0	0	0	0	1	0	1	0
4	3	5	2	6	2	6	7	16
5	1	3	5	2	1	9	7	15
6	1	1	0	0	2	1	3	2
7	1	0	0	0	0	0	1	0
	6	10	7	10	7	16	20	36
Mean	5.0	4.3	4.7	3.7	4.3	4.7	4.8	4.3

in a particular case and thus indicate the relative importance of the several possible causes. A clutch larger than the number of POF can obviously occur when several females lay in a single nest. For example, bird 1055 was collected specifically because two females were using the same box. A lower clutch size can occur in several ways. The bird may drop eggs on the ground. Eggs may ovulate into the body cavity. A bird (male or female) may remove eggs (e.g. males are known to throw eggs out when the female is killed). A predator, such as a Blue Jay, may remove single eggs. It is apparent that clutch size is a dubious measure for certain aspects of reproduction.

It seems unlikely that predation or disturbance of nests was entirely responsible for the discrepancies here observed. Starlings vigorously defend their nests against squirrels and Blue Jays. Although many hours were spent in the area both checking the clutch-size and observing behavior, no squirrel or jay was seen molesting a nest. When disturbance by

boys or male Starlings did occur, the eggs were generally seen on the ground below the nest.

The problem of determinate laying was examined from the viewpoint of the number of POF and the clutch size. The last column of table 1 (Treatment) shows whether the nest was unmolested (normal) or eggs were added (add) or eggs removed (subtract). Table 2 shows the number of eggs in normal nests, in nests to which eggs were added, and in nests from which eggs were subtracted. "Ovulated" refers to the number of POF seen in the ovary. "Clutch" refers to the number of eggs in the nest. For example, in nests to which eggs had been added there were 6 cases of a clutch of 4 and 2 cases of a bird that ovulated 4 eggs. Since there is no statistical difference among the "normals", "addition" and "subtraction" groups, all have been totaled in the last column. To restrict the data to first clutches, only birds that completed laying in April were used. (More data are available for clutch size than for eggs ovulated because not all females that laid were captured and their ovaries successfully sectioned.) While differences in the averages exist, the lack of consistency prevents one from concluding that the addition of eggs causes a reduction in the number laid and the removal of eggs causes an increase. It is, therefore, concluded that starlings are determinate layers.

DISCUSSION

The validity of conclusions about a contrast between clutch size and the number of ova ovulated depends upon the correct counting of the POF. In birds collected during the incubation period, the POF are large and readily identifiable under low power. Also BAF are easily distinguished. Some direct comparisons have been made. The number of eggs laid by captive pheasants was compared (Meyer *et al*, 1947) with the number of POF and a very close agreement obtained, even though the hens may have eaten some eggs. Kabat *et al.* (1948) found a very close correlation even for birds killed several months after laying. From studies of wild pheasants, Buss *et al.* (1951) concluded that many eggs are dropped on the ground and that desertion of a partial clutch is common. From these results it is concluded that the number of POF counted in birds killed during incubation is very close to the true number ovulated.

The evaluation of the extent of difference of clutch size and number of eggs ovulated requires a reconsideration of conclusions derived from a study of clutch size. For some purposes the difference is immaterial. For example, the productivity of a species depends upon how many eggs survive and the fact that some eggs never reach the nest does not affect

the use of clutch size to describe actual productivity. However, potential productivity may be affected and, if some factor affects the number of eggs wasted, then some management procedure may increase the clutch size by increasing the number actually reaching the nest.

If one is assessing the effect of some factor on clutch size then it may be essential to know the number of eggs ovulated. The alternative is to assume that the factor has no effect on the proportion of ovulated eggs that are placed in the nest. The generalities developed by Lack (1948) and Davis (1955a) need reexamination. For example, seasonal changes in clutch size might be due to changes in proportion of eggs put into the nest. The increase in clutch size in the early part of the laying period (see Davis 1955a for examples) may merely mean that a higher proportion of eggs is wasted at the beginning. The common finding that yearling birds lay fewer eggs than do adults may merely mean that yearlings have to learn to get the eggs into the nest.

While many additional examples could be cited, it seems only necessary to note that problems arise in interpretation. Unfortunately, for a variety of obvious reasons it is unlikely that many birds will be collected for examination of ovaries by the tedious procedure of serial sections. In some cases (gulls) the POF are macroscopically visible, but still the bird must be killed. Thus, there remains for most work simply an evaluation of the possibility of error due to the assumption that, in the groups whose clutch sizes are being compared, the number of eggs that exist in the nest is the same proportion of the total ovulated.

SUMMARY

The number of eggs ovulated by Starlings (*Sturnus vulgaris*) was determined by serial sections of the ovary and compared with the number (clutch) of eggs in the nest box of each bird. For 32 birds the number of ovulations was the same as the clutch-size in only 7 cases. The ovulations were greater in 16 cases and smaller in 9. A variety of causes can result in loss of eggs. An excess can result when 2 females lay in the same box.

The fact that clutch-size is not necessarily an indication of number of eggs ovulated means that interpretations of the biological implications of changes or differences in clutch-sizes need to be examined carefully.

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The Johns Hopkins School of Hygiene and Public Health, Baltimore 5, Md.

PROCEEDINGS OF THE SEVENTY-FIFTH STATED MEETING OF THE AMERICAN ORNITHOLOGISTS' UNION

BY HAROLD MAYFIELD, SECRETARY

THE Seventy-fifth Stated Meeting of the American Ornithologists' Union was held from September 10 to 15, 1957, at Cape May, New Jersey. Business sessions were held on September 10, papers sessions on September 11, 12, and 13, and field trips on September 14 and 15. Sponsoring organizations were the Philadelphia Academy of Natural Sciences and the Delaware Valley Ornithological Club.

BUSINESS SESSIONS

On September 10, the Council met throughout most of the day, the Fellows met late in the afternoon, and the Fellows and Elective Members met together in the evening. The Council and the Fellows met again separately on September 12.

1958 Meeting.—The Seventy-sixth stated meeting (75th anniversary) will be held from October 14 to 19, 1958, in New York City, by invitation of American Museum of Natural History, the Linnaean Society of New York, the National Audubon Society, and the New York Zoological Society. This city was the site of the founding and of the fiftieth anniversary meeting. Dean Amadon of the American Museum of Natural History was appointed Chairman of the Local Committee.

1959 Meeting.—The Council tentatively selected Regina, Saskatchewan, for the 1959 meeting, probably to be held in late August of that year. This would be the first meeting in the Prairie provinces of Canada. Final decision will be made at the 1958 meeting.

The Council also considered an invitation from Michigan and views that region favorably for a future meeting, perhaps 1960.

Awards. The Brewster Memorial Award, by action of the Council, was presented to Robert P. Allen of Tavernier, Florida, for his life history studies of the large wading birds. The author was commended for these important contributions to ornithology obtained through painstaking research and illuminated by philosophical conclusions. Of these studies, those on the Whooping Crane (1952 and supplement in 1956) and on the Flamingo (1956) were published within the last five years.

Marcia B. Tucker Awards, assisting young ornithologists of promise to attend the annual meeting, were given by vote of the officers to Walter Bock, Paul Johnsgard, Douglas Lancaster, and Richard L. Zusi.

Patrons. The Council voted to inscribe the names of five members permanently in the rolls of the Union as Patrons in recognition of generous contributions to the organization: Crawford H. Greenewalt, Ludlow

Griscom, Mrs. B. Brewster Jennings, Loye Holmes Miller (through a gift in his honor by Mrs. Herbert E. Carnes), and Josselyn Van Tyne (posthumously).

Amendments to the By-Laws. Several amendments to the By-laws and Rules were proposed by the Fellows and considered by the Council. Final action on these proposals will be taken at the 1958 meeting of Fellows:

Article I, Section 1. "The membership of the Union shall consist of the following classes: (1) Fellows, (2) Emeritus Fellows, (3) Honorary Fellows, (4) Corresponding Fellows, (5) Elective Members, (6) Members, (7) Honorary Members, and (8) Patrons." (Adds the class "Honorary Members.")

Article I, Section 2, second sentence. "They (the Fellows) shall be limited to fifty individuals of not more than sixty years of age, and this without prejudice to the number, status, or further election of older Fellows." (Formerly the age division was set at sixty-five years.)

Article I, Section 6, second sentence. "Elective Members shall be limited to two hundred individuals of not more than seventy years of age, and this without prejudice to the number or status of older Elective Members." (Formerly the number was limited to 200 individuals regardless of age.)

Article I, Section 8. "Honorary Members shall be elected by the Council. To be eligible for the class of Honorary Member a person shall have performed meritorious service to the Union, to ornithology or to allied sciences which, in the opinion of the Council, merits this special recognition. If the person elected has been an Elective Member, he shall be designated an Honorary Elective Member." (This is a new section. It gives official status to a class previously recognized without sanction by the By-laws.)

Article IV, Section 3, paragraph 2: Eliminate the second sentence, which begins "During the first year . . . ." and insert instead the sentence, "A retiring Vice-president is not eligible for immediate re-election as Vice-president."

Article V, Section 1. "Annual dues will be paid by Fellows, Elective Members and Members. The amount of the annual dues will be set by the Council. No dues shall be required of Patrons, Honorary Fellows, Corresponding Fellows, Emeritus Fellows, or Honorary Members." (This removes the amount of dues from the By-laws and specifies the exempt classes.)

Article V, Section 5. "Fellows, Elective Members, and Members, not in arrears for dues, and Emeritus Fellows, Honorary Fellows, Corresponding Fellows, and Honorary Members shall receive the regular serial

publication of the Union, entitled 'The Auk,' gratis." (This specifies which classes get 'The Auk' free and implies that there may be special publications of the Union which do not go automatically to members of any class.)

Reports of Officers. The Secretary reported that 3109 copies of 'The Auk' are being mailed; this mailing list includes all classes of members, subscriptions, and exchanges with other journals. The Treasurer's records showed members by classes as follows:

Fellows	73
Fellows Emeriti	2
Honorary Fellows	19
Corresponding Fellows	65
(all those elected in 1956 have signified acceptance)	
Elective Members	195
Honorary Life Elective Members	3
Members	2330
Honorary Life Members	26
Total Membership	2713

The Council voted to elect John B. May, Honorary Life Elective Member.

The report of the Treasurer appears in full elsewhere in 'The Auk'. The Treasurer's records were examined and found in order by the Auditing Committee (Hoyes Lloyd, Chairman; S. Dillon Ripley; and Frederick C. Lincoln).

The Council decided that the income from the Josselyn Van Tyne Memorial Fund be used for research in ornithology in the broadest sense. Awards are to be made on the recommendation of the Research Committee and may cover various expenses in a research project, such as travel, equipment, clerical help, publication and other items. This fund was started in February, 1957, and already amounts to more than $5000. Efforts to enlarge this fund will be directed by Philip S. Humphrey.

Stephen S. Gregory, Chairman of the Investing Trustees, reported that the appraised value of the endowment holdings on July 31, 1957, was $106,461 after the withdrawal of $12,328 through liquidation of the Special Publications Fund to provide additional money for the printing of the Check-list. The net earnings of the fund for the ten months ending July 31, 1957, were $3,304.86.

The Editor of 'The Auk,' Robert W. Storer, reported that the four issues, beginning with the October, 1956, issue, contained 544 pages and

30 plates. Col. L. R. Wolfe has consented to prepare the Index of the present volume along with his work on the Ten-year Index. The Ten-year Index for the 1940's by Charles K. Nichols is to be printed in the coming year unless unforeseen difficulties arise. Special thanks were expressed to Frank McKinney, who has been responsible for the Recent Literature section of "The Auk."

Handbook. Ralph S. Palmer, Editor of the proposed Handbook, reported that manuscripts for the first volume should be completed by December 1, 1957. Most of the range maps for this volume are completed and work on the other illustrations has begun.

Reports of Committees. A. W. Schorger, Chairman of the Committee on Biography, reported that three memorials and eight obituaries were published during the year ending with the April, 1957, issue of 'The Auk.' During the year ending October 21, 1957, the committee received notices of the deaths of eleven Members, two Elective Members, four Fellows, one Corresponding Fellow, and one Honorary Fellow:

Logan Johnson Bennett, Elective Member, Sept. 12, 1957, Las Vegas, N.M.
John R. Cruttenden, Member, Sept. 7, 1956, at Quincy, Ill.
Ralph Emerson DeLury, Member, Sept. 20, 1956, at Port Perry, Ontario.
William Gilbert Fargo, Member, Feb. 2, 1957, at Pass-A-Grille, Fla.
Edwin Marble Hasbrouck, Member, May 25, 1956, at Washington, D.C.
Miss Pearl Heaps, Member, July 6, 1956, at Baltimore, Md.
Laurence Emerson Hicks, Fellow, Jan. 20, 1957, at Columbus, Ohio.
Edward Andrews Ingraham, Member, Oct. 7, 1956, at Brooklyn, N.Y.
Sir Norman Boyd Kinnear, Honorary Fellow, Aug. 11, 1957, London, England.
W. C. Malcolm, Member, July 5, 1956, at Trochu, Alberta.
Walter Reginald Brook Oliver, Corresponding Fellow, May 16, 1957, at Wellington, N.Z.
Lucius H. Paul, Member, Aug. 6, 1955, at Rochester, N.Y.
Howard Robertson, Member, Oct. 17, 1956, at Los Angeles, Cal.
William Rowan, Fellow, June 30, 1957, at Edmonton, Alberta.
James Savage, Elective Member, Feb. 7, 1957, at Buffalo, N.Y.
John William Scott, Member, Aug. 15, 1956, at Laramie, Wyoming.
Josselyn Van Tyne, Fellow, Jan. 30, 1957, at Ann Arbor, Mich.
Robert Walcott, Member, Nov. 11, 1956, at Boston, Mass.
John Todd Zimmer, Fellow, Jan. 6, 1957, New York City.

William H. Behle, Chairman of the Committee on Student Membership Awards, reported by mail that 47 students were named to receive 'The Auk' free of charge for one year. Their names were published in the April, 1957, issue of 'The Auk'.

Donald S. Farner, Chairman of the Committee on Research, reported that there has been consideration of another major publication comparable to "Recent Studies in Avian Biology" (1955), but it was agreed that such volumes should be spaced several years apart. It will be a respon-

sibility of this Committee to recommend awards from the Josselyn Van Tyne Memorial Fund.

Alexander Wetmore, Chairman of the Committee on Classification and Nomenclature, reported that the work of this Committee was completed with the publication of the Fifth Edition of "The A.O.U. Check-list of North American Birds" on August 28, 1957. By action of the Finance Committee, the price was set at $8.00 per copy. The book contains 704 pages. The edition is 3000 copies letterpress, with provision for a further printing by offset if necessary. The Committee asked that it be discharged after 18 years of work. The Council expressed special thanks to this Committee.

Mrs. Herbert E. Carnes, Chairman of the Endowment Committee, reported additions to the Endowment Fund of $5171 between October 1, 1956, and July 31, 1957. This amount included gifts entitling Ludlow Griscom, Loye Miller (through contribution from Mrs. Carnes), and Josselyn Van Tyne to be named as Patrons. The other Patrons elected at this meeting were recognized for gifts to other phases of the work of the organization.

Ira N. Gabrielson submitted the report prepared by E. R. Kalmbach, Chairman of the Committee on Bird Protection. This report appears in full separately in 'The Auk.'

Between the 1956 and 1957 meetings of the A.O.U., President Ernst Mayr appointed a special Committee for the Relief of Hungarian Ornithologists with Frederick Greeley, Chairman.

Alexander Wetmore reported that the Library of Congress had consented to preserve certain early records of the A.O.U. These records, which had been in the possession of T. S. Palmer, would be available to members and other interested scholars. The Council voted to deposit these records in the Library of Congress.

Election of Officers. At the meeting of Fellows and Elective Members, the officers were re-elected, except as follows: Austin L. Rand advanced automatically from Second to First Vice-president; and George H. Lowery, Jr., who had vacated the office of First Vice-president, was immediately elected Second Vice-president.

Four new members were elected to the Council to fill vacancies there: John T. Emlen, Jr., Eugene Eisenmann, Olin Sewall Pettingill, Jr., and John W. Aldrich. The complete list of officers and Council members appears on pp. 78–79.

Robert W. Storer had indicated at the last annual meeting that he wished to resign as Editor of 'The Auk' after the completion of the present volume (October, 1957). The Council accepted his resignation with warmest thanks for his five years' service in this position.

Eugene Eisenmann was elected Editor of 'The Auk' by action of the Council.

ELECTION TO SPECIAL CLASSES OF MEMBERSHIP

FELLOW

Donald S. Farner, Pullman, Washington
Hans Albert Hochbaum, Delta, Manitoba, Canada
Harrison B. Tordoff, Ann Arbor, Michigan

CORRESPONDING FELLOWS

Walter Hoesch, Okahandja, South Africa
Günter Niethammer, Bonn, West Germany

ELECTIVE MEMBERS

Virgilio Biaggi, Jr., Mayaquez, Puerto Rico
Tom J. Cade, Los Angeles, California
William C. Dilger, Ithaca, New York
Donald R. Eckelberry, Babylon, New York
William W. Griffin, Atlanta, Georgia
Frank A. Hartman, Columbus, Ohio
David W. Johnston, Macon, Georgia

ATTENDANCE

Registration at the meeting included 380 people from 35 states, the District of Columbia, 2 provinces of Canada, England and the Philippine Islands, as follows:

ENGLAND—*Oxford:* Mr. and Mrs. William J. L. Sladen.

PHILIPPINES—*Dumaguete City:* Dioscoro S. Rabor.

CANADA—*Ontario:* Mr. and Mrs. A. E. Allin, Mr. and Mrs. Rowley Frith, Mr. and Mrs. L. Everett Jaquith, Mr. and Mrs. Hoyes Lloyd, Robert MacLaren, Mrs. M. H. Mitchell, George W. North, Mrs. C. D. Quilliam, Mr. and Mrs. L. L. Snyder, Mr. and Mrs. George M. Stirrett, Dorothy M. Wallace. *Saskatchewan:* Fred W. Lahrman.

UNITED STATES—*Alabama:* Thomas A. Imhof. *Arizona:* Joe T. Marshall, Jr. *Arkansas:* Douglas A. James. *California:* Eben L. McMillan, Gladys McMillan, Gregory McMillan, Alden H. Miller, John E. Taft. *Connecticut:* Mr. and Mrs. E. Alexander Bergstrom, Mary A. Heimerdinger, Philip S. Humphrey, Peter M. Isleib, Charles E. Mohr, S. Dillon Ripley. *Delaware:* Mr. and Mrs. William Baxter, Jr., Mrs. Delano King Boynton, King Boynton, Mr. and Mrs. Crawford H. Greenewalt. *District of Columbia:* John W. Aldrich, Charles H. M. Barrett, Shirley Briggs, Mr. and Mrs. Hiden T. Cox, Mr. and Mrs. Malcolm Davis, Mr. and Mrs. H. G. Deignan, Bernard Feinstein, Herbert Friedmann, Mr. and Mrs. Frederick C. Lincoln, Virginia H. Russell, Ben B. Warfield, Mr. and Mrs. Alexander Wetmore. *Florida:* Oliver L. Austin, Jr., Tony Austin, J. C. Dickinson, Jr., Samuel A. Grimes, Henry M. Stevenson, Lovett E. Williams, Jr. *Georgia:* J. Fred Denton, David W. Johnston, H. L. Stoddard, Ivan R. Tomkins.

Illinois: Amy G. Baldwin, Karl E. Bartel, Mr. and Mrs. Frank Bellrose, Nicholas Collias, Mr. and Mrs. Hubert R. Doering, Mr. and Mrs. Stephen S. Gregory, S. Charles Kendeigh, Mr. and Mrs. Cyrus Mark, Mr. and Mrs. Austin L. Rand, Melvin A. Traylor, Jr., Albert Wolfson, Mrs. Grace M. Yeatter, Ralph E. Yeatter. *Indiana:* M. Philip Kahl, Val Nolan, Jr., Ruby O. Wolfe. *Iowa:* Mrs. Ora van Heeswyk.

Kansas: John William Hardy. *Kentucky:* Mr. and Mrs. Yancey R. Altsheler. *Louisiana:* Douglas A. Lancaster, Mr. and Mrs. George H. Lowery, Jr., Robert J. Newman, Edwin Willis. *Maine:* O. S. Pettingill, Jr., Frederick P. Poole. *Maryland:* John C. Boyd, Allen J. Duvall, Sue R. Flick, Frederick K. Hilton, Marshall C. Johnston, Walden Pell, II, Mr. and Mrs. A. Ogden Ramsay, Chandler S. Robbins, Stephen W. Simon, Robert Sundell, Robert A. Tyson. *Massachusetts:* Aaron M. Bagg, R. H. Barth, Jr., L. M. Bartlett, Jack Beattie, Walter J. Bock, Mr. and Mrs. Prince S. Crowell, Richard T. Darby, William H. Drury, Jr., Mrs. Ruth P. Emery, Carl W. Helms, Mr. and Mrs. Ernst Mayr, Dorothy E. Snyder, Wendell Taber, Louis B. Thacher, Jr. *Michigan:* Laurence C. Binford, Robert D. Burns, Mr. and Mrs. Nicholas L. Cuthbert, Mr. and Mrs. Donald W. Douglass, Mrs. Edith K. Frey, Elmer J. Kuhn, Peter Stettenheim, Mr. and Mrs. Robert W. Storer, Mrs. Josselyn Van Tyne, George J. Wallace, Richard L. Zusi. *Minnesota:* Mrs. Mary L. Lupient. *Missouri:* Paul Bruce Dowling, Hazel B. Philbrick. *New Hampshire:* Robert W. Smart.

New Jersey: Robert C. Alexander, Mr. and Mrs. William J. Bailey, Richard O. Bender, Irving H. Black, Mrs. Herbert E. Carnes, Ann Chamberlain, Mrs. Richard Chamberlain, Dorothy M. Compton, Robert C. Conn, James K. Davis, Mr. and Mrs. Stanley S. Dickerson, Anna M. Flaherty, Mr. and Mrs. Russell S. Fowler, Gladys Gordon Fry, Robert L. Haines, Francis Harper, Mrs. C. M. Howard, Mr. and Mrs. Joseph Irish, Joseph R. Jehl, Jr., John M. Jubon, Donald E. Kunkle, M. Albert Linton, Edward R. Manners, John A. McDougall, Mr. and Mrs. Frank W. McLaughlin, Herbert H. Mills, Mr. and Mrs. Thurlow C. Nelson, Harvey L. Patten, Mr. and Mrs. Julian K. Potter, George B. Reynard, Charles H. Rogers, Anna Rutherford, William F. Sandford, Katharine M. Schmucker, Mr. and Mrs. Thomas F. Shea, Jeff Swinebroad, Sarah A. Thomas, Fred Kent Truslow, Mrs. Anne W. Wachenfeld, Helen J. Williams, Floyd P. Wolfarth. *New York:* Mr. and Mrs. Arthur A. Allen, Mr. and Mrs. Dean Amadon, Robert F. Andrle, Vera Auten, Harold H. Axtell, Mr. and Mrs. John H. Baker, Mr. and Mrs. Wilson C. Bloomer, Mr. and Mrs. Winston Wm. Brockner, Carl W. Buchheister, Paul A. Buckley, John L. Bull, Robert L. Burnap, John Bursewicz, Geoffrey Carleton, Peter Crary, A. J. Dignan, David W. Dunham, Mr. and Mrs. Stephen W. Eaton, Mr. and Mrs. Don R. Eckelberry, Mrs. C. N. Edge, Eugene Eisenmann, Mr. and Mrs. Robert W. Ficken, Richard B. Fischer, Devin A. Garrity, E. Thomas Gilliard, Robert H. Grant, Marjorie E. Groesbeck, Mr. and Mrs. William M. Groesbeck, Fred T. Hall, James M. Hartshorne, Mr. and Mrs. Oliver H. Hewitt, Mrs. Southgate Y. Hoyt, Mrs. Raymond V. Ingersoll, Mr. and Mrs. Paul A. Johnsgard, Mr. and Mrs. Peter Paul Kellogg, Wesley E. Lanyon, Elizabeth S. Manning, Heinz K. Meng, Harold D. Mitchell, Mr. and Mrs. James Monroe, Mrs. Robert Cushman Murphy, Theodora Nelson, Mr. and Mrs. Maynard A. Nichols, Ralph S. Palmer, Roger Payne, Mr. and Mrs. Gilbert S. Raynor, Edward L. Seeber, Dorothy Seeber, Lester L. Short, Jr., Mr. and Mrs. Charles G. Sibley, Neal P. Smith, Stuart Craig Smith, Mrs. Dayton Stoner, Mr. and Mrs. Lyman K. Stuart, Brenda Sullivan, Mr. and Mrs. John K. Terres, Edward C. Ulrich, Mr. and Mrs. Charles Vaurie, Jason A. Walker, Donald H. Warren, Robert Werrlein, Mr. and Mrs. S. LeRoy Wilcox, David A. West, Mr. and Mrs. Robert G. Wolk.

North Carolina: Charles H. Blake, Wendell P. Smith. *Ohio:* Mrs. Robert V. D. Booth, James Bruce, Ralph W. Dexter, Frank A. Hartman, Harold F. Mayfield, Vincent P. McLaughlin, Mildred Miskimen, Warner Seely, Mr. and Mrs. Milton B. Trautman. *Oregon:* Chris Mathews. *Pennsylvania:* Charles R. Burk, Mrs. C. R.

Burk, Jr., James Bond, Dorothy L. Bordner, Mrs. Earl R. Bordner, Joel Cadbury, Joseph M. Cadbury, Ernest A. Choate, Robert E. Cook, Mr. and Mrs. Kenneth B. Corbett, David A. Cutler, Mr. and Mrs. John D. Denney, Joseph M. Devlin, James A. Fowler, Frederick V. Hebard, Mrs. Harold Hibbert, Quintin Kramer, Mr. and Mrs. Philip A. Livingston, Mr. and Mrs. Norman J. McDonald, John F. McIlvain, J. d'Arcy Northwood, Mr. and Mrs. William Overlease, Kenneth C. Parkes, Myrtle S. Pelot, Earl L. Poole, Mr. and Mrs. Frank W. Preston, Conrad W. Raker, Hannah Ely Raker, H. Radclyffe Roberts, Mr. and Mrs. Wm. Ely Roberts, Mr. and Mrs. Robert H. Sehl, Mr. and Mrs. Robert C. Stein, Mr. and Mrs. Phillips B. Street, Elizabeth A. Taft, Mr. and Mrs. Lester S. Thomas, W. E. Clyde Todd, John E. Trainer, Mr. and Mrs. Henry T. Underdown, Mr. and Mrs. Rodman Ward, Mr. and Mrs. Harold B. Wood, Mr. and Mrs. Merrill Wood, William F. Zimmerman. *Rhode Island:* James Baird, Roland C. Clement, Mrs. A. G. Davenport. *South Carolina:* John Henry Dick, Alexander Sprunt, Jr., Alexander Sprunt, IV. *Tennessee:* Joseph C. Howell, Mrs. Amelia R. Laskey, James T. Tanner. *Texas:* L. Irby Davis, Ernest P. Edwards. *Virginia:* E. J. Barnes, Gorman M. Bond, Mrs. C. L. Burgess, Mr. and Mrs. Ira N. Gabrielson, Edith Hague, Florence S. Hague, Elizabeth J. Mulloy, Milton S. Mulloy, J. J. Murray. *Washington:* Donald S. Farner. *West Virginia:* Richard R. Bond, Mr. and Mrs. Maurice G. Brooks, Earl N. McCue. *Wisconsin:* Mr. and Mrs. Robert P. Breitenbach, John T. Emlen, Jr., Mr. and Mrs. A. W. Schorger.

PUBLIC SESSIONS

Papers sessions were held in the morning and afternoon of each of the three days beginning Wednesday, September 11. The papers sessions were held in Convention Hall at Cape May, New Jersey.

WEDNESDAY MORNING SESSION

The meeting was opened by an address of welcome by M. Albert Linton for the Academy of Natural Sciences of Philadelphia and by Philip A. Livingston for the Delaware Valley Ornithological Club. Ernst Mayr, President of the American Ornithologists' Union, responded. Secretary, Harold F. Mayfield, summarized the results of the previous day's business sessions, including elections and awards.

The Forms of the Common Screech Owl (*Otus asio*) in Mexico. (Slides) JOE T. MARSHALL, JR., Department of Zoology, University of Arizona, Tucson, Arizona, and Western Foundation of Vertebrate Zoology.

Character Displacement in Some Philippine Cuckoos (*Centropus*). (Slides) KENNETH C. PARKES, Carnegie Museum, Pittsburgh, Pennsylvania.

Isolating Mechanisms Between American Crows. (Slides) DAVID W. JOHNSTON, Department of Biology, Mercer University, Macon, Georgia.

Analysis of Hybridization in Red-shafted and Gilded Flickers. (Slides) LESTER L. SHORT, JR., Department of Conservation, Cornell University, Ithaca, New York.

The Present Status of the Rarer Lesser Antillean Birds. JAMES BOND, Academy of Natural Sciences of Philadelphia, Philadelphia, Pennsylvania.

WEDNESDAY AFTERNOON SESSION

Breeding Behavior of the Black-Headed Weaverbird *Textor Cucullatus Graveri* (*Hartert*), In the Belgian Congo. (Motion Picture) ELSIE C. COLLIAS and NICHOLAS E. COLLIAS, Illinois College, Jacksonville, Illinois.

Observations on the Life History of the Tinamou, *Crypturellus boucardi*. (Slides) DOUGLAS A. LANCASTER, Louisiana State University, Baton Rouge, Louisiana.

Studies of the Breeding Biology of the Lapland Longspur. WILLIAM H. DRURY, JR., Biological Laboratories, Harvard University, Cambridge, Massachusetts.

The Nest, Eggs, and Young of the Pileated Flycatcher, *Aechmolophus mexicanus*. (Motion Picture) ERNEST P. EDWARDS, Houston Museum of Natural History, Houston, Texas.

Breeding Cycle and Nest Orientation in a Colony of Chimney Swifts at Kent, Ohio. (Slides) RALPH W. DEXTER, Department of Biology, Kent State University, Kent, Ohio.

Feeding Behavior of the Black Skimmer. (Motion Picture) RICHARD L. ZUSI, Museum of Zoology, University of Michigan, Ann Arbor, Michigan.

Pair Formation in the Black Skimmer. (Slides) ROBERT G. WOLK, Department of Biology, St. Lawrence University, Canton, New York.

Celestial Orientation by Wild Mallards. (Slides) FRANK BELLROSE, Illinois Natural History Survey, Havana, Illinois.

THURSDAY MORNING SESSION

The Effect of Human Depopulation on the Birds of the Malton Valley Area of Tennessee. (Slides) JOSEPH C. HOWELL, Department of Zoology and Entomology, University of Tennessee, Knoxville, Tennessee.

The Southeastern Limits of the Breeding Ranges of Certain North American Birds and the Associated Ecological Factors. (Slides) J. FRED DENTON, Medical College of Georgia, Augusta, Georgia.

Determinants of the Lower Altitudinal Limits of Nesting Juncos. (Slides) JAMES T. TANNER, Department of Zoology, University of Tennessee, Knoxville, Tennessee.

The Pine-Oak Avifauna of Mexico as a Source of California Species. (Slides) ALDEN H. MILLER, Museum of Vertebrate Zoology, University of California, Berkeley, California.

The Identification of Bird Communities. (Slides) S. CHARLES KENDEIGH, University of Illinois, Urbana, Illinois.

Sampling Error in the Spot-Mapping Method of Estimating Breeding Bird Populations. DOUGLAS JAMES, Department of Zoology, University of Arkansas, Fayetteville, Arkansas.

The Food Supply of Wintering Bird Populations in Missouri. (Slides) PAUL BRUCE DOWLING, Missouri Conservation Commission, Weldon Spring, Missouri.

THURSDAY AFTERNOON SESSION

The Limiting Effects of Low Temperatures upon Nocturnal Departure in Migratory Wood Warblers in Fall. JOSEPH M. DEVLIN and JACK N. WYKOFF, 218 South 43rd Street, Philadelphia, Pennsylvania.

Symposium on Migration of Southern Hemisphere Birds

ALBERT WOLFSON, Cresap Laboratories, Northwestern University, Evanston, Illinois, *Moderator*

The Stimulatory Mechanisms Influencing Migration. DONALD S. FARNER, Department of Zoology, State College of Washington, Pullman, Wash.

Migration of Antipodean Pelagic Birds. OLIVER L. AUSTIN, JR., Research Studies Institute, Maxwell Air Force Base, Alabama.

Migration of South American Birds. ALEXANDER WETMORE, Smithsonian Institution, Washington, D. C.

Casual Notes on Bird Migration in Southern Africa. HERBERT FRIEDMANN, Smithsonian Institution, Washington, D. C.

Migration of Malayan and East Indian Birds. AUSTIN L. RAND, Chicago Natural History Museum, Chicago, Illinois.

Migration of Australian Birds. ERNST MAYR, Harvard University, Cambridge, Massachusetts.

FRIDAY MORNING SESSION

Chemical Responses of Bird Seminal Vesicle to Varying Doses of Testosterone. (Slides) FREDERICK K. HILTON, Johns Hopkins School of Hygiene and Public Health, Baltimore, Maryland.

Effect of Food Intake on Fat Metabolism in the Ringnecked Pheasant Hen. (Slides) R. P. BREITENBACH, R. K. MEYER, and C. L. NAGRA, Departments of Zoology, University of Wisconsin, Milwaukee, and Madison, Wisconsin.

Winter Variation in Weights of Tree Sparrows. (Slides) CARL W. HELMS, Biological Laboratories, Harvard University, Cambridge, Massachusetts.

Serum Proteins as Taxonomic Characters. (Slides) CHARLES G. SIBLEY, Department of Conservation, Cornell University, Ithaca, New York.

Double Articulation of the Lower Jaw of Birds. (Slides) WALTER J. BOCK, Biological Laboratories, Harvard University, Cambridge, Massachusetts.

Diving and Underwater Locomotion of the California Murre. (Motion Picture) PETER STETTENHEIM, Museum of Zoology, University of Michigan, Ann Arbor, Michigan.

Factors in Avian Locomotion. (Slides) FRANK A. HARTMAN, Ohio State University, Columbus, Ohio.

FRIDAY AFTERNOON SESSION

Experiments on the Possible Uses of Some Tranquilizing Drugs in Ornithology. (Slides) OLIVER H. HEWITT, Department of Conservation, Cornell University, Ithaca, New York.

Prey Location in Total Darkness by a Barn Owl. (Slides) ROGER PAYNE and WILLIAM H. DRURY, JR., Biological Laboratories, Harvard University, Cambridge, Massachusetts.

A Quantitative Comparative Study of the Courtship Displays of the Mallard, The Black Duck, and of a Hybrid between Them. (Motion Picture) A. OGDEN RAMSAY, McDonough School, McDonough, Maryland.

Some Courtship Displays of the Horned Grebe. (Motion Picture) ROBERT W. STORER, Museum of Zoology, University of Michigan, Ann Arbor, Michigan.

Studies of a Dry-Land Colony of Western Grebes. (Slides) FRED W. LAHRMAN, Regina, Saskatchewan.

Display and Mate Selection in Whydahs (*Coliuspasser*) and Bishop Birds (*Euplectes*). (Slides) JOHN T. EMLEN, JR., Department of Zoology, University of Wisconsin, Madison, Wisconsin.

Effect of Objects on Morphology of Bower Birds. (Motion Picture) E. THOMAS GILLIARD, American Museum of Natural History, New York, New York.

Observations on the Social and Hostile Behavior of Captive Redpolls. (Slides) WILLIAM C. DILGER, Laboratory of Ornithology, Cornell University, Ithaca, New York.

SOCIAL EVENTS

A Reception, followed by dinner for Fellows and Council members, was held in the Macomber Hotel on September 10. "Midland to Maritime," a motion picture by Frank W. McLaughlin, was shown in Convention Hall. The President's Coffee Reception was held in the Colonial Hotel.

Motion pictures by Arthur A. Allen ("Cornell's New Research Center for the Laboratory of Ornithology") and James M. Hartshorne ("Vocalizations of the Trumpeter Swan") were shown in the evening of September 11. An Open House was held in the Colonial Hotel.

The Annual Banquet was held on September 13 in the Colonial Hotel.

FIELD TRIPS

On Saturday, September 14, visitors were taken on an all-day trip to the Brigantine National Wildlife Refuge and the Beach Haven Inlet area. On Sunday, September 15, there was a boat trip through the Inland Waterway. Those who wished to visit the Hawk Mountain Sanctuary were taken by private cars to Reading, where the night was spent. On Monday, the group visited Hawk Mountain.

RESOLUTIONS

The following resolutions were submitted by the Resolutions Committee (Alden H. Miller, *Chairman;* Eugene Eisenmann; and Kenneth Parkes) and approved by the General Session on September 13, 1957.

Resolved, that the people of Stone Harbor and Cape May be commended for setting aside and preserving the Stone Harbor Bird Sanctuary and the Witmer Stone Sanctuary. The Stone Harbor Sanctuary is for the purpose of preserving a large and important heron rookery and the Witmer Stone Sanctuary for general bird preservation and to commemorate the name of Witmer Stone, the best known student of Cape May birds.

Resolved, that the American Ornithologists' Union in formal congress assembled congratulates the Japanese Association for the Protection of Birds on its success in preserving for posterity the last remaining colony of the Short-tailed Albatross, *Diomedea albatrus*, and extends its thanks and gratitude for their efforts in behalf of science and humanity.

Resolved, that the American Ornithologists' Union heartily endorses the methods proposed by the Bureau of Sport Fisheries and Wildlife for protecting uniformed and civilian air personnel on Midway Island against the possibilities of accident from collisions with birds, either by means of levelling the areas adjacent to air-strips to prevent albatrosses soaring,

or by means of tarring nearby sand surfaces to eliminate the presence of sooty terns. The Union hopes that these constructive conservation measures will be pursued and carried out before any attempt is made to use other means involving potential destruction of these bird populations.

Resolved, that the Conservation Commission of the state of Michigan be commended for setting aside suitable areas of State Forest to be managed permanently for the benefit of the Kirtland's Warbler. We believe this may be the first preserve created for a song bird in America.

Resolved, that the American Ornithologists' Union assembled for its 75th Stated Meeting, at famous and memorable Cape May, New Jersey, takes this opportunity to express its deep appreciation of the warm hospitality and excellent planning of this highly successful meeting by the Local Committee on Arrangements and by our two host organizations: The Academy of Natural Sciences of Philadelphia, and the Delaware Valley Ornithological Club. The Union extends its warmest thanks to each member of the Local Committee:

Co-Chairmen: M. Albert Linton, Philip A. Livingston, and Phillips B. Street

Robert C. Alexander
William J. Bailey
Joseph M. Cadbury
Betty Carnes
Ernest A. Choate
Mr. and Mrs. John M. Jubon
F. Russell Lyons
Mr. and Mrs. Norman J. McDonald
Mr. and Mrs. Frank W. McLaughlin
Mr. and Mrs. William Overlease
Mr. and Mrs. Thomas F. Shea
Sarah H. Thomas

And be it further *resolved* that the Union express its thanks to:

Cape May County Historical Society
Cape May County Art League
Woman's Community Club of Cape May Court House
Cape May Geographic Society
Witmer Stone Club of Stone Harbor
Audubon Center of South Jersey
New Jersey Audubon Society
Owners of Homes and Historic Buildings,

for their cordiality and assistance.

OFFICERS AND TRUSTEES OF THE AMERICAN ORNITHOLOGISTS' UNION

	Expiration of Term
Ernst Mayr, *President*	1958
Austin L. Rand, *First Vice-President*	1958
George H. Lowery, Jr., *Second Vice-President*	1958
Harold F. Mayfield, *Secretary*	1958
Charles G. Sibley, *Treasurer*	1958
Eugene Eisenmann, *Editor of 'The Auk'*	1958

ELECTIVE MEMBERS OF THE COUNCIL

S. Dillon Ripley	1958
Dean Amadon	1958
John W. Aldrich	1958
Donald S. Farner	1959
Thomas R. Howell	1959
Ralph S. Palmer	1959
John T. Emlen, Jr.	1960
Eugene Eisenmann	1960
Olin Sewall Pettingill, Jr.	1960
Thomas R. Howell, Cooper Ornithological Society Representative	1958
Maurice Graham Brooks, Wilson Ornithological Society Representative	1958

Ex-Presidents:
James P. Chapin, 1939–42
Herbert Friedmann, 1937–39
Ludlow Griscom, 1956
Hoyes Lloyd, 1945–48
Alden H. Miller, 1953–56
Robert Cushman Murphy, 1948–50
Alexander Wetmore, 1926–29

INVESTING TRUSTEES

Stephen S. Gregory	1958
Clarence B. Randall	1958
A. W. Schorger	1958

COMMITTEES 1957–1958

COMMITTEE ON BIOGRAPHY: Walter J. Breckenridge, *Chairman.* Maurice G. Brooks, Hildegard Howard, J. Murray Spiers, Wendell Taber.

COMMITTEE ON BIRD PROTECTION: E. R. Kalmbach, *Chairman.* Jean Delacour, I. N. Gabrielson, Robert A. McCabe, David A. Munro.

COMMITTEE ON THE BREWSTER MEMORIAL AWARD: Albert Wolfson, *Chairman.* Dean Amadon, Joseph J. Hickey, George H. Lowery, Jr., Charles G. Sibley.

EDITORIAL COMMITTEE: Eugene Eisenmann, *Chairman.* Don R. Eckelberry, John T. Emlen, Wesley E. Lanyon, Ernst Mayr, Frank McKinney, Robert W. Storer, George M. Sutton, L. R. Wolfe.

COMMITTEE ON ENDOWMENT: Betty Carnes (Mrs. Herbert E.), *Chairman.* Arthur A. Allen, Rudyerd Boulton, Jean Delacour, Roger T. Peterson, Olin Sewall Pettingill, Herbert L. Stoddard, Alexander Wetmore.

COMMITTEE ON FINANCE: Charles G. Sibley, *Chairman.* Ernst Mayr, Harold Mayfield, Burt L. Monroe, Hoyes Lloyd, Austin Rand.

COMMITTEE ON NOMINATION OF FELLOWS AND ELECTIVE MEMBERS: Dean Amadon, *Chairman.* Eugene P. Odum, Robert W. Storer.

COMMITTEE ON NOMINATION OF HONORARY AND CORRESPONDING FELLOWS: S. Dillon Ripley, *Chairman.* I. McT. Cowan, Austin Rand.

COMMITTEE ON NOMINATION OF MEMBERS: Charles H. Blake, *Chairman.* James M. Abbott, Charles M. Brookfield, G. C. Carol, James B. Cope, Paul E. Downing, John J. Elliott, Thomas H. Foster, Frank P. Frazier, Fred T. Hall, Frederick N. Hamerstrom, Jr., Pershing S. Hofslund, Joseph C. Howell, George E. Hudson, Howard S. Huenecke, Charles E. Huntington, Thomas A. Imhof, Bennett R. Keenan, Frederick W. Loetscher, Jr., John F. McIlvain, Gale Monson, Robert J. Newman,

Harold S. Peters, Loren S. Putnam, Thomas L. Quay, Thomas H. Rogers, Henry M. Stevenson.

COMMITTEE ON PROGRAM: Thomas R. Howell, *Chairman*. Harold Mayfield, Harrison B. Tordoff, James T. Tanner.

COMMITTEE ON PUBLICATIONS: The Editor of "The Auk" (Eugene Eisenmann), *Chairman*. The President, the Secretary, the Treasurer, the Editor of the Ten-Year Index to "The Auk" (L. R. Wolfe), Charles K. Nichols.

COMMITTEE ON RESEARCH: Donald S. Farner, *Chairman*. Andrew J. Berger, John T. Emlen, S. Charles Kendeigh, Ralph S. Palmer, Harrison B. Tordoff, Milton B. Trautman, M. D. F. Udvardy.

COMMITTEE ON STUDENT AWARDS: William H. Behle, *Chairman*. Joseph C. Howell, Robert T. Orr, Raymond A. Paynter, Jr., Harrison B. Tordoff.

LOCAL COMMITTEE ON ARRANGEMENTS FOR THE 1958 ANNUAL MEETING: Dean Amadon, *Chairman*. Carl Bucheister, John L. Bull, Geoffrey Carleton, William C. Conway, Jr., Herbert Johnson, Mrs. Carll Tucker, Charles H. Young.

REPORT TO THE AMERICAN ORNITHOLOGISTS' UNION OF THE COMMITTEE ON BIRD PROTECTION, 1957

On the international scene mention should be made of the first conference of the International Committee for Bird Protection to be held in Africa, which took place in Bulawayo, Southern Rhodesia, July 8–10, 1957. It was attended by representatives of 10 National Sections including the United States, Canada and Venezuela. Rudyerd Boulton, Jr. was appointed as official delegate of the Union. At the meeting it was reported that the International Convention for the Prevention of the Pollution of the Sea by Waste Oil (London, 1954) had been ratified by Belgium, Canada, Denmark, Ireland, German Federal Republic, Mexico, Norway, Sweden and the United Kingdom. The great importance of obtaining the support of the United States for this Convention was strongly urged.

In the United States the 84th Congress (first session) did not establish a notable record of conservation achievements, though several important actions were taken, some of which had a bearing on the welfare of birdlife, directly or indirectly. Many years of education, planning, and effort were climaxed with the passage by both Houses of the Congress of a bill authorizing the establishment of a Key Deer National Wildlife Refuge to protect the Florida Key deer and other fauna and flora of that unique semi-tropical area. The Act authorizes the Fish and Wildlife Service to acquire up to 1,000 acres of land by purchase, donation, or exchange, although the use of condemnation proceedings is denied on any island traversed by overseas highway No. 1 to Key West. Appropriations for land acquisition are limited to $35,000.

Efforts were made to revise the Migratory Bird Hunting Stamp Act so that a greater part of the annual receipts must be used for the acquisition of migratory bird refuges. Objections were voiced to an increase in the stamp fee as a means of raising additional revenue until the Federal Government shows that it is willing to appropriate more money from general revenue to assist the U. S. Fish and Wildlife Service in carrying out its duties and obligations without having to resort to the use of the special duck stamp funds. A number of bills on this subject were introduced during the 1st Session and committee hearings held. More serious attention to this subject is expected from Congress during the 1958 Session.

No action was taken on a bill that would authorize the Secretary of the Interior, through the Fish and Wildlife Service, to undertake basic research into the effects of insecticides, herbicides and fungicides on wildlife. This bill has the endorsement of the Department of the Interior and action may come on it in 1958.

Your president and the chairman of this committee responded in separate letters to a request from the Department of the Interior for helpful suggestions in the Department's program of reorganization of the Fish and Wildlife Service. Intensified research of the highest quality was urged with the added thought that Federal research and activities be restricted to those provinces that are definitely Federal in character. By deleting from the Federal program those functions that can be handled competently at State or local levels, Federal appropriations may be applied to a broader and more thorough job on those projects that cannot be carried out efficiently at lower governmental levels.

From Dr. Yoshimaro Yamashina comes the encouraging word that the Short-tailed Albatross has been breeding on Tori Shima, an island some 300 miles south of Tokyo and about midway between Tokyo and the Bonin Islands where the bird was formerly reported. According to the staff of the meteorological station on Tori Shima there were 23 adults present in 1953 but, due to feral cats and dogs as well as human interference, no young were raised. In 1954 the Japanese Association for the Protection of Birds appealed to the staff of the station and laborers were warned off the nesting area. The Japanese Government also forbade news photographers to disturb the birds. As a result 3 young were raised in 1955–56 and 8 young in the following year (1956–57). In addition to the reduction of the number of cats and dogs for which the Association provided traps, the Yamashina Institute for Ornithology and Zoology prevailed upon the Ministry of Agriculture and Forestry to designate Tori Shima as a reservation and the staff of the meteorological station were authorized to guard the island. Also, the Ministry of Education named the Short-tailed Albatross, *Diomedea albatrus*, as a Natural Monument of Japan early in 1957.

The "gooneys" of Midway Island, the Laysan and Black-footed Albatrosses (*Diomedea immutabilis* and *D. nigripes*), are subjects of study by the U. S. Fish and Wildlife Service. This investigation, sponsored by the Bureau of Aeronautics, Department of the Navy, was occasioned by the hazard to aircraft created by the presence of these birds on and over the runways. It is reported that from November 20, 1956 to June 15, 1957, 399 albatrosses were struck and killed by aircraft during 1728 landings and takeoffs on that island. A promising approach to this problem involves the levelling of sand dunes and unused revetments adjacent to runways. These irregularities of the terrain cause air currents to be deflected upwards, thus creating favorable soaring conditions for the birds. Where this has been done in connection with construction work on that island, the soaring of albatrosses has been greatly reduced. Reduction of the hazard created by a dense colony of nesting Sooty Terns

close to one of the runways is being sought through the hard-topping of the area involved, causing the birds to move elsewhere. A similar procedure has been used for water catchment on the island. The Fish and Wildlife Service is to be commended for this approach whereby the hazard to aircraft, particularly jet-propelled planes may be lessened materially without having to resort to a killing program.

The results of waterfowl breeding-ground surveys in 1957 indicate that there has been little change in the size of the population breeding in Canada, although there has been some redistribution of birds in reponse to a decline of water areas in southern Alberta and southwestern Saskatchewan.

With the view of reducing the excessive kill of waterfowl both the Canadian and United States Wildlife Services have issued regulations prohibiting the use, in hunting, of recorded calls of these birds. Such prohibition was needed particularly in the hunting of geese to which the feeding call was an irresistible attraction.

To forestall the threat of mining operations in one of the world's most important goose colonies, the Northwest Territories Council established the Bowman Bay Game Sanctuary embracing 500 square miles on Baffin Island. Surrounding this game sanctuary within which exploration, hunting and industrial activity are completely prohibited, the Canadian Wildlife Service set up the Dewey Soper Migratory Bird Sanctuary. Within the bird sanctuary, which has an area of 3150 square miles, hunting is prohibited but mining may be allowed under permit provided all necessary steps are taken to prevent damaging the habitat.

The Hawaiian Division of Fish and Game has transmitted an encouraging report on the status of the Laysan Teal. A careful census made on Laysan Island from June 25 to July 3, 1957 indicated a population of at least 580. Under permit from the U. S. Fish and Wildlife Service, 8 birds were brought back to the Honolulu Zoo for propagation and, as of August 5, all appeared to be healthy and thriving.

Also on the favorable side is the status of the Hudsonian Godwit and the Trumpeter Swan. Fairly large numbers of the godwits have been reported on some of the refuges in the United States, while the Trumpeter Swan may be approaching the saturation point in the habitat it now occupies. In the Lower Copper River Valley in Alaska, 26 broods of swans were reported, averaging 4.1 young to the brood. All those that could be observed closely proved to be Trumpeters. The birds also are said to be nesting on the Kenai Peninsula.

At the time this report was prepared, the year 1957 gives indication of being a promising one for the Whooping Crane. Public interest in the survival of this species remains at a high level and it seems likely that

no Whooping Cranes were lost through illegal hunting at least for four years. The wild population seems to have had a relatively successful season and, on July 12, Canadian observers reported having seen, in Wood Buffalo Park, three families, each with a single young. Additional young may have been produced in another area that could not be searched.

In the United States the successful raising, at the New Orleans Zoo, of two young to a size approaching that of the adults, is a most gratifying event, offsetting somewhat the unfortunate loss of a wild adult through attempts at capture on a Federal Refuge. Under the experienced care of George Scott, aviculturalist of the Bronx Zoo, from the time the eggs were hatched in May until the birds were nearly full-grown, these two individuals and their parents may become the progenitors of a race saved from the very brink of extinction. The ultimate success of the Whooping Crane in 1957 can be revealed, however, only after the migrating population of wild birds has again returned to the Texas coast where they can be counted.

An effort to preserve a rare species through the perpetuation of its favored and exclusive habitat is taking place in Michigan in connection with Kirtland's Warbler. There the Michigan Audubon Society, in cooperation with the Michigan Department of Conservation, is setting up a project for the establishment and maintenance of permanent Jack pine areas so essential to the bird's welfare. Trees 5 to 12 feet high are optimum for the bird's use, so a program of continuous, successional management must be established.

The failure of the Congress to make provision for an expanded and thorough study by the Fish and Wildlife Service of the effect of various pesticides on wildlife is extremely unfortunate. In the meantime the use of such pest control agents is spreading rapidly, often with little concern for their effect on beneficial forms of fauna and flora. In the Middle West, where the Dutch elm disease is making inroads, there is accumulating evidence of the careless use of DDT in the control of the bark beetle, an important vector in the transmission of the disease. In the absence of comprehensively compiled information on the effect of insecticidal operations on birds generally, one finds an incongruous mixture of facts, fantasy and conjecture. It has been shown that single applications of DDT at the rate of 1 pound per acre of forest had little or no effect on the number of birds, whereas single applications of 5 pounds per acre caused heavy mortality. Likewise, the use of 1.5 to 3 pounds per tree for the control of the Dutch elm disease resulted in a 22 percent reduction in bird numbers with some evidence that part of this may have been due to movement of the birds out of the sprayed area. DDT residues remain toxic for extended periods and prolonged exposure of quail

and pheasants to them has resulted in decreases in production, fertility and hatchability of the eggs and the vitality of the young. Other chlorinated insecticides produce similar adverse effects.

The situation, then, is that available information shows that chlorinated insecticides have caused damage to birdlife under field conditions, but that the extent of damage may be minimized by controlling the rate and time of application. Until more quantitative data become available, it does not appear possible either to endorse widespread application or to condemn such treatment as unduly harmful. It was just such a study that was contemplated by the Fish and Wildlife Service under the measure that failed of passage in the past Session of the Congress.

Increased experimental use of repellents to lessen damage to crops and forest plantings by both birds and mammals has characterized recent research by the Federal Government in cooperation with State and private agencies. Not only does this approach obviate the necessity of killing programs but it permits the offending species to render whatever beneficial services they may be capable of. This approach, somewhat scoffed at only a few years ago, now is attracting the attention of crop specialists and foresters throughout the country.

Most of the materials so far tested are "chemical" in nature and some are actually toxic, yet their use in reduced concentrations make them relatively safe. Nevertheless the aim being sought are non-toxic repellents which may be used by the individual concerned, thus obviating the necessity of stringent supervision.

Much of the research in this field has been conducted by the Fish and Wildlife Service at its two laboratories, at the Patuxent Research Refuge at Laurel, Maryland and at the Wildlife Research Laboratory, Federal Center, west of Denver, Colorado. Progress reports Nos. 1 and 2 on the subject of bird repellents, compiled at the Denver Laboratory, give a digest of the work so far done.

Submitted September 2, 1957

E. R. KALMBACH, *Chairman*
JEAN DELACOUR
IRA N. GABRIELSON
ROBERT A. MCCABE
DAVID A. MUNRO

TREASURER'S REPORT

For the Period October 1, 1956–July 31, 1957

Income to Active Fund Account

Dues		
Fellows	$324.00	
Elective Members	771.00	
Members	8,647.65	$9,742.65
Subscriptions		1,587.25
Sale of back issues of *The Auk*		450.60
Royalties on microfilms of *The Auk*		2.47
Miscellaneous sales		108.50
Advertising		40.00
Donations to Active Publication Fund		631.00
Committee on Arrangements, Denver Meeting, 1956		400.00
Income from:		
General Endowment Fund		1,923.01
Ruthven Deane Fund		326.44
Balance in Active Account 1956		545.38
Interest—Savings Account—1956–57		259.87
Bank Refund		1.06
Total Income, 1957		$16,018.23

Special Funds

Brewster Memorial Fund		
Income from investments	$528.23	
Cost of 1956 medal		$18.68
To G. H. Lowery, Jr.		509.55
	$528.23	$528.23
Educational Endowment Fund		
Balance forward	$15.12	
Income from investments	270.67	
Refund to W. H. Behle		$7.10
47 student members, 1957		188.00
Balance in Account		90.69
	285.79	285.79
Bird Protection Endowment Fund		
Balance forward	$117.04	
Income from investments	67.02	
Donation to the International Union for the Protection of Nature and Natural Resources		$25.00
Donation to the International Committee for Bird Preservation		25.00
Donation to the International Wildfowl Research Bureau		25.00
Balance in Account		109.06
	$184.06	$184.06

Special Publication Fund		
Income from investments	$394.28	
Entire Fund liquidated and deposited for payment of Check-list costs	12,327.53	
Paid to E. Biebighauser for indexing Check-list		$350.00
Balance in Account		12,371.81
	$12,721.81	$12,721.81
Endowment Fund		
Balance in uninvested funds, 1956	$74.71	
Life membership payments	1,648.00	
Patron payments	450.00	
Donations	477.00	
To Investing Trustees		$2,575.00
Balance in Account		74.71
	$2,649.71	$2,649.71
Research Book Fund		
Balance forward	$128.17	
Book sales	244.50	
Book purchase		$346.82
Balance in Account		25.85
	$372.67	$372.67
Handbook of North American Birds Fund		
Balance forward	$4,753.10	
Donations	1,550.00	
Supplies, equipment and services		$4,029.87
Balance in Account		2,273.23
	$6,303.10	$6,303.10
Marcia B. Tucker Fund		
Balance forward	$106.86	
Returned by 1956 Awardee	25.00	
Donation for 1957 Awards	500.00	
Douglas Lancaster		$200.00
Walter Bock		80.00
Richard Zusi		100.00
Paul Johnsgard		100.00
Balance forward		151.86
	$631.86	$631.86
Van Tyne Memorial Fund		
Received for investment	$5,531.00	
Printing and supplies		$217.60
Balance in Account		5,313.40
	$5,531.00	$5,531.00

DISBURSEMENTS

Manufacture and distribution of *The Auk* (3 issues)		$9,978.22
Reprints from *The Auk* for the A.O.U.		19.06
Editor's Expense		532.43
Secretary's Expense		125.35
Treasurer's Expense		755.71
Mailing of back issues and other publications		479.77
Annual Meeting Expense, 1957		542.47
Addressing service and supplies		235.08
Stationery, labels, etc.		187.97
Telephone and telegraph		3.25
Purchase and postage for back issues of *The Auk*		21.39
Cost of dues notices		213.29
Membership Committee Expenses		58.77
Affiliation Fee, A. I. B. S.		100.00
Donation, Zoological Society of London		25.00
Donation, International Committee on Zoological Nomenclature		10.00
Total expended, 1957		$13,287.76
TOTAL INCOME, 1957	$16,018.23	
Balance in Active Account, 1957	$2,730.47	
Balance in Endowment Fund	74.71	
Balance in Educational End. Fund	90.69	
Balance in Bird Protection End. Fund	109.06	
Balance in Research Book Fund	25.85	
Balance in Handbook Fund	2,273.23	
Balance in Tucker Fund	151.86	
Balance in Van Tyne Fund	5,313.40	
Balance in Special Publication Fund	12,371.81	
	$23,141.08	
Savings Account, First National Bank, Ithaca, N. Y. and Ann Arbor Bank, Ann Arbor, Mich.		$19,724.78
Checking Account, First National Bank, Ithaca, N. Y., July 31, 1957		3,477.59
		$23,202.37

CHARLES G. SIBLEY, *Treasurer*

GENERAL NOTES

Cattle Egret (*Bubulcus ibis*) Nesting in Cuba.—On April 24, 1957, Eric L. Mills, Barry M. Millman, and I were directed to a small bay on the property of the Cuban naturalist, Sr. Maderera Babun, by Sr. Babun and Sr. Mario Santamaria. The bay is approximately one mile west of the port of Santiago de Cuba in the province of Oriente. As we approached it we saw several Cattle Egrets in breeding plumage flying from it to a nearby pasture and bringing back sticks. They were landing in the trees of a small island. We estimated that 50 or more pairs were present, and watched for twenty minutes while many of the birds continued to make forays for sticks. Several were seen displaying.

Also present in the trees, but apparently not nesting at this time, was a smaller number of Little Blue Herons *Florida caerulea*, and Snowy Egrets *Leucophoyx thula*. Unfortunately, we had not the facilities to reach the island, nor the time to return.

Mr. James Bond (*in litt.*) informs me that this is the first recorded nesting colony of the Cattle Egret in Cuba, and the third in the West Indies.—W JOHN SMITH, *40 Roslyn Ave., Ottawa 1, Ontario, Canada.*

Ross' Geese Nesting at Southampton Island, N.W.T., Canada.—Two Ross' Goose (*Chen rossi*) nests and several of the birds were sighted among the Blue and Snow Geese (*Chen caerulescens*) in the colony at the Boas River Delta, Southampton Island, during the summer of 1956. (We use *caerulescens*, because we regard these latter forms to be color phases.) This area is approximately 540 miles east southeast of the Perry River area where Ross' Geese are known to nest.

The possibility of finding Ross' Goose nesting in the area was first suggested by Graham Cooch of the Canadian Wildlife Service. The senior author accompanied Mr. Cooch during the 1953 nesting season study of Blue and Snow Geese. In the course of that study two flightless female Ross' Geese were caught and banded in banding drives of flightless Blue and Snow Geese on July 31 and Aug. 1. Both of these Ross' Geese had signs of what might have been brood patches. Both banding drives covered an area 5–7 miles inland from the high tide line. This was much further inland than the area covered in the daily study routes through the goose nests; hence the Ross' Goose nests, if present somewhat inland, were missed.

Eskimo Toma who participated in the banding drives that year said he had shot a Ross' Goose the previous year (1952) at Prairie Point on the east side of South Bay approximately 92 miles east of the Boas River Delta.

In 1956 the authors were in the Boas River studying Brant (*Branta bernicla*), this time alert to the possibility of sighting Ross' Goose nests. On June 25 a single Ross' Goose flew inland to the North, low over our camp on one of the River delta islands, 2½ miles from shore. This bird was noticeably smaller than the Snow Geese nesting all about us, and its stubby bill and warty upper mandible were obvious. The grinning patch characteristic of Snow Geese, and the orange iron stain present to some degree in the Southampton Snows were absent in this goose. Most distinctive feature of the Ross' was its high-pitched squeaky call. We watched the bird until it circled and landed among the islands and waterways toward the north horizon.

Another Ross' Goose was seen on July 10 while we were hiking North along the water courses toward the inland edge of the Blue-Snow Goose colony. This bird circled among the river islands about 7 miles inland. About 3 miles further inland, Eisenhart discovered a Ross' Goose nest on a large, low island about 100 yards from water. The nest was built up of willow and moss, and was lined with white down similar to that of a Snow Goose. There were two eggs in the nest. One egg was

about the size of a Brant egg, the other slightly larger. As we approached, the female was on the nest, the male standing about 5 feet away. A pair of Snow Geese were nesting about 30 yards off. As we drew near, the Snow Geese left their nest and walked away from us toward the Ross' Geese. The Ross' Geese joined the Snows in their retreat, showing no signs of territorial aggressiveness common among Snow and Blue Geese. We had an excellent chance to compare the two species.

On July 16, a second Ross' Goose nest was found about four miles inland on a river island. It was 200 yards from water, was built of moss and willow, and contained three eggs measuring 74 x 49 mm, 76 x 53 mm, and 75 x 50 mm. All eggs were pipped. Only the female was seen at the nest. On July 17, this second nest was revisited. All eggs were hatched. The young were polymorphic—one gray, one yellow, one pearl gray. Color photographs were made of the female at the nest. On July 18 the young had left the nest.

In a round-up Aug. 4 of flightless geese for banding, two flightless Ross' Geese were captured and banded.—THOMAS W. BARRY, *Canadian Wildlife Service, Edmonton, Alberta, Canada* AND JAY N. EISENHART, *Department of Conservation, Cornell University.*

Three Additions to the Avifaunal Records of Newfoundland.—Throughout the first week of June, 1955, five adult Greater Scaup, *Aythya marila nearctica*, two males and three females, were observed by Hewitt on a fresh-water pond near Portugal Cove South. Since only the Lesser Scaup had previously been reported from Newfoundland, one adult male was collected by James Lowther on June 6. The specimen was presented to Mr. L. M. Tuck, Dominion Wildlife Officer.

On June 13, 1953, a mated pair of Common Scoters, *Oidemia nigra americana*, was seen on a fresh-water pond on the Avalon Peninsula, about eight miles inland from Cape Broyle. The male, in breeding condition, was collected by Hewitt and presented to L. M. Tuck. On July 16, 1955 two female Common Scoters with their downy-young broods consisting of seven and two, were observed on separate small lakes in the interior of the Avalon Peninsula. No males or other species of waterfowl were seen on these ponds. One female and four of her brood were collected by the authors on a four-acre pond at a point 8.5 miles W. of Cape Broyle. The skins have been deposited with the National Museum of Canada (female and two young). Cornell University (one young) and the remaining young with L. M. Tuck. As far as can be determined, this is the first substantiated breeding record of the Common Scoter in Newfoundland. Probable breeding had, however, been reported, by Bent (U. S. Natl. Mus. Bull. 130:121, 1925), and by Peters and Burleigh (Birds of Newfoundland, p. 123. Dept. Nat. Resources, St. John's Newfoundland, 1951).

On June 9, 1956, at Cape Broyle, a male Bobolink (*Dolichonyx oryzivorus*) was collected by Peters. This bird had established a territory in a one-acre grass clearing at the west end of the town and was singing from trees around its edge. This specimen, now in Mr. Tuck's possession, establishes the first record of a Bobolink for Newfoundland.—STUART S. PETERS AND OLIVER H. HEWITT, *Department of Conservation, Cornell University, Ithaca, New York.*

Xantus' Murrelet (*Endomychura hypoleuca scrippsi*) from the State of Washington.—In the course of rearranging the races of the Marbled Murrelet (*Brachyramphus marmoratum*) in the U. S. National Museum Collection it was noted that one of the winter plumage specimens, previously identified as that species, did not quite resemble the majority. Further investigation showed that it was not a Marbled Murrelet but rather a Xantus' Murrelet. This was substantiated by Dr.

H. Friedmann. This is evidently the first specimen from the state of Washington and the most northern record for this southern California species, which is recorded as wintering north to Monterey Bay, and casually to Point Arena, California (A.O.U. Check-list, 5th ed., p. 252, 1957).

The specimen, no. 365372 of the U. S. National Museum, Biological Survey Collection, was collected by S. G. Jewett at Copalis Beach, Greys (= Grays) Harbor County, Washington, on December 6, 1941. The bird, a male in fresh plumage, lacks the white nuchal collar, lores and scapulars characteristic of the Marbled Murrelet. The white underwing coverts and inner webs of the primaries, (except for the tips), and the short wing, long tarsus and long culmen, are characteristic of *Endomychura hypoleuca*. The measurements of the Washington bird are given below along with the measurements I made of a series of male Marbled and Xantus' Murrelets. Marbled Murrelet: 5 winter males, 3 from Washington and 2 from Alaska: wing (chord), 125–129.5; culmen, 16.5–18; tarsus, 16.5–17.5 mm. Xantus' Murrelet: 3 summer males, from Los Coronados Islands, Mexico: wing, 118–120; culmen, 18.5–19; tarsus, 22.5–25.5 mm. The Washington specimen: wing, 120.5; culmen, 19.5; tarsus, 25 mm. Subspecific identification places the Washington bird with *Endomychura hypoleuca scrippsi* of the islands of southern California and Baja California, rather than *Endomychura hypoleuca hypoleuca* of Guadalupe Island. There is no dimensional difference between the races, according to the describers of *scrippsi*, J. E. Green and L. W. Arnold (Condor, **41**: 28, 1939), who note that *scrippsi*, as compared with nominate *hypoleuca*, has the loral, suborbital and auricular regions slaty-black (instead of white), as does the Washington specimen.—Bernard Feinstein, *Smithsonian Institution, Washington, D. C.*

Swallow-tailed Kite in Bermuda.—On March 17, 1957 a Swallow-tailed Kite, *Elanoides forficatus forficatus* was found dead 12 feet above the ground, where it was entangled in the branches of an Australian Pine Tree growing on the grounds of the Bermuda Biological Station. This appears to be the first Bermuda record. The bird was found by some children, who brought it to the laboratory. It proved to be an adult female with a well developed ovary. The bird weighed 12.5 ounces and had the following measurements in inches: length, 23.5; extent, 53; wing, 17.6; outer tail feather 13.1; middle tail feather, 5.5 and culmen 0.9. I prepared the skin and presented it to Mr. Louis S. Mowbray, Director of the Bermuda Aquarium and Museum, where it is to be kept for the record.—Alfred O. Gross, *11 Boody Street, Brunswick, Maine.*

An Erroneous Record of the Carolina Parakeet and Other Animals in Montana.—In the mid-1800's, Rudolph Friederich Kurz, a Swiss artist, visited the interior of North America, spending the winter of 1851–1852 at the trading post of Fort Union, in what is now Roosevelt County, Montana. Kurz's journal of his travels was translated by Myrtis Jarrell and, after editing by J. N. B. Hewitt, was published in 1937 as Bulletin 115 of the Smithsonian Institution.

Throughout the published version of the journal appear numerous references to various kinds of animals seen by Kurz on his journey. Of particular interest is the entry for April 17, 1852 (Hewitt, *op. cit.*: 329), in which Kurz lists various kinds of animals seen in the vicinity of Fort Union, Montana. Among those listed in the translation as "here in great numbers" are "parrakeets." Fort Union, Montana, is far to the northwest of Oliver County, North Dakota, which is regarded as the northwestern-most definite record of occurrence of the Carolina Parakeet, *Conuropsis carolinensis* (A. O. U. Check-list of North American Birds, 5 ed., 1957: 267). More

western, Colorado localities for this species (see Ridgway, 1916, U. S. Nat. Mus. Bull. 50, pt. 7, p. 148) were deemed unsubstantiated by the A. O. U. Committee (A. Wetmore, *in litt.*, Oct. 23, 1957).

To check the accuracy of the translation, I requested from the Smithsonian Institution a facsimile of the typed copy, in German, of the original manuscript. This was kindly supplied by Dr. Frank H. H. Roberts, Jr., Acting Director, Bureau of American Ethnology. Comparison of the typed copy of the original German with the version published in English showed several inconsistencies. To ascertain if the Smithsonian Institution had a true transcription of the original manuscript I requested, from the Berne (Switzerland) Historical Museum, a photostatic copy of that part of the original manuscript bearing the entry for April 17, 1852. This was kindly supplied by Dr. Karl H. Henking, Director, Division of Ethnography, Berne Historical Museum.

The most notable error in the translation was of the last five words in the April 17, 1852, entry of Kurz's hand-written manuscript which, in regard to the vicinity of Fort Union, lists certain animals, including the parakeets, that "kommen hier nicht mehr vor." These words mean "are no longer met with here," or "no longer are to be found (or occur) here." In the context of a traveler's journal, the "no longer" does not imply that Kurz ever saw parakeets in the vicinity of Fort Union. Kurz had travelled up the Mississippi and Missouri rivers to reach Fort Union, and was doubtless referring to the fact that, having seen the parakeets farther to the south and east, he no longer observed them at this stage of his journey. For the benefit of those ornithologists and mammalogists who might use the published version of Kurz's journal as a source for records of occurrence of birds and mammals, I include my own translation of the April 17, 1852, entry. This was made from the photostat of the original hand-written journal page, with the aid of Mrs. Helga Vigliano, Instructor, Department of Germanic and Slavic Languages and Literatures, University of Kansas. Marginal notes appearing in the original manuscript are included, but are identified as such. Materials in brackets are my own. The translation is as follows:

> "I visited the store room to note down the various kinds of animals indigenous to the region, which offers a rather complete list of the quadrupeds. The most numerous are: buffalo, elks (Elaphus canadensis Aud. and Bach.—*marginal note*), Virginia deer, pronghorns, gray wolves and prairie wolves, gray and red [? — the word appears to be "Lüchse" = lynxes, but probably is "Füchse" = foxes], mice; then, grizzly bears, beaver, big horn sheep, black-tailed deer, ermines, porcupines, muskrats (musk rat, musquash, Fiber zibethicus Aud.—*marginal note*), otters, martens, skunks (common Amer. skunk Mephitis Chinga—*marginal note*), cross foxes. In addition I found the pelt of a wolverine (wolverene, glutton, carcajou, quickhatch, Gulo luscus Linn.). It was long haired, entirely black except on the sides of the paunch where it was dark brown; the tail was long and bushy and the head was pugdoglike. I have never seen a living example of this animal. Also, the pelt came from the Crees.
>
> "Rabbits (gray rabbit Lepus sylvaticus—*marginal note*), squirrels, badgers, rats, black bears, black and red wolves, tortoises, raccoons, cougars, lynxes, prairie dogs, buzzards, parakeets, fireflies, stinging flies [mis-read by the original translator as "Bienen" = bees; the word is "Bremen" = any kind of stinging fly, such as a tabanid], turkeys, doves [perhaps pigeons], are no longer met with here."

That portion of Jarrell's published version that deals with the material in the second paragraph of the original manuscript reads as follows:

> "Among those whose pelts I failed to find are rabbits, squirrels, badgers, rats, black bears, and black and red wolves. Other wild creatures native here in great numbers are tortoises, raccoons, cougars, lynxes, prairie dogs, buzzards, parrakeets, turkeys, doves, fireflies, and bees." (Hewitt, *loc. cit.*)

Jarrell not only failed to translate the "no longer met with here," but inserted "native here in great numbers," which appears neither in the Smithsonian copy of the German, nor in the photostat of the original journal. In addition, he did not recognize that "das Fell" (= pelt) in the last sentence of the first paragraph of the entry for April 17, referred to the pelt of the wolverine mentioned in the preceding three sentences. He failed also to note, in the published version, that the entry for April 17, 1852, is in an appendix added by Kurz to the regular diary or journal; this information was supplied by Dr. Karl H. Henking (*in litt.*, April 30, 1957).—THANE S. ROBINSON, *Department of Zoology, University of Kansas, Lawrence, Kansas (present address: Department of Biology, Western Michigan University, Kalamazoo, Michigan).*

The Status of *Pteroglossus didymus* P. L. Sclater.—In the Proceedings of the Zoological Society of London for 1890 (p. 403) Sclater described a new toucan from "Upper Amazonia" under the name *Pteroglossus didymus*. This was based on a single specimen, obviously allied to *Pteroglossus viridis humboldti*. In the 67 years since its description this bird has remained unique and its status has been impossible to determine. Thus, Peters (1948: 77) writes of it, ". . .range unknown," but gives the distribution of *humboldti* as southeastern Colombia, eastern Ecuador, northeastern Peru, and adjacent parts of western Brazil to Rio Solimões and Rio Madeira, south to northern Bolivia. Griscom and Greenway (1941: 198) record nominate *viridis* from several localities in lower Amazonia (Maracá, Obidos, Rio Jamundá) and write that it is replaced by *didymus* in, ". . .far upper Amazonia. This race and *humboldti* bridge the gap between *viridis* and *inscriptus*." Pinto (1938: 332–333) lists *inscriptus*, *humboldti*, and *viridis*, but does not mention *didymus* as a Brazilian bird. Gyldenstolpe (1945: 115–116, and 1951: 120) makes no mention of *didymus* either, although listing *humboldti* from a number of Amazonian localities. Meyer de Schauensee (1949: 623–624) lists *humboldti*, but not *didymus*, from extreme southern Colombia. Snethlage (1914: 226) and Cory (1919: 373) list *didymus* merely from the upper Amazon valley of eastern Peru. To complete this survey, it may be mentioned that Brabourne and Chubb (1912: 159) list both *didymus* and *humboldti* from eastern Peru, the former undoubtedly solely on the basis of the type specimen.

Recently I was called to examine and identify some birds received alive from Leticia, extreme southern Colombia, by Mr. Lowry Riggs, a dealer of Rockville, Maryland. Leticia is on the north bank of the Amazon close to Tabatinga, Brazil, and is just across the river from Peruvian territory. This is the same area where Riggs' collector, in an earlier shipment, obtained the long lost Colombian Red-eyed Cowbird, *Tangavius armenti*. Among other birds in the present shipment, which included the seldom procured *Selenidera reinwardtii*, was a toucan which fitted the description and the colored plate (Cat. Birds Brit. Mus., vol. 19, 1891, pl. 6) of *didymus*. This bird, since purchased for exhibition in the New York Zoological Park, appears to be the first example of this supposed form since the hitherto unique type specimen taken not later than 1890. The chief character by which *didymus* differs from *humboldti* and *inscriptus* is the absence of black transverse markings along the maxillary tomium, these marks being well developed in the latter two forms. The

live bird has the maxilla less extensively clear olive yellow below the dusky culminal stripe than in Sclater's figure of his type, and largely dark brown to blackish somewhat streaked lengthwise, but with a sizeable clear yellowish area occupying its middle third or more. It is more like *didymus* than any other described toucan, and is identified as such without question. In plumage the two are alike, and it may be that the bill difference is due to the type being a fully adult bird and the present example not quite so mature.

Several months after the bird went to the New York Zoological Park, Mr. L. S. Crandall wrote me that the bird was changing and becoming more like the published plate, and like *humboldti*, thereby corroborating the assumption of its being immature. To quote from his letter, " . . little by little the color of the bill has changed, so that while the mandible is still black, the maxilla is clear, with a black culminal stripe and a slight dark area toward the tip. The notches along the tomia were dark a month ago but now the markings are creeping upward, forming small transverse streaks."

Mr. Riggs' collector probably acquires his birds for shipment from the Indians over a fairly considerable area in the neighborhood of Leticia, so it is not possible to pin down the locality of capture of this toucan more exactly than to call it the "Leticia area," which would include extreme southern Colombia, extreme eastern Peru, and the adjacent areas of Brazil. However, *humboldti* has been reported from Loretoyacu, Colombia, about 80 kilometers northwest of Leticia, and even as far north as Meta, nearly 4° N. latitude. It has, thus, been recorded to the north, south, east, and west of Leticia, and it can only be assumed that the range of *humboldti* probably includes that of the so-called *didymus*. This makes one wonder if the latter is really anything more than an occasional aberrant *humboldti*, which is what I strongly suspect. If not, then *didymus* would probably have to be considered a distinct species sympatric with, and exceedingly similar in size and in plumage coloration to *Pteroglossus viridis humboldti*. This is certainly much less likely than the former disposition of the case. Until evidence to the contrary is produced, the known facts hardly justify continuing to give *didymus* standing as a distinct form. It is apparently only an aberrant, occasional variant of *Pteroglossus viridis humboldti*.

I am indebted to Mr. Lee S. Crandall for making a further examination of the toucan after its arrival in the New York Zoological Park and corroborating my identification of the bird with the description and published colored plate of *didymus*. This note is published by permission of the Secretary of the Smithsonian Institution.

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—HERBERT FRIEDMANN, *U. S. National Museum, Washington, D. C.*

Traill's Flycatcher Breeding in North Carolina.—In a willow copse at the edge of the North Wilkesboro airport the explosive "fitz-bew" of a Traill's Flycatcher (*Empidonax traillii*) attracted our attention on June 13, 1956. Our decision to collect the bird was based on the absence of any other breeding evidence for this species in North Carolina. Shortly after the specimen was secured another singing male was located within 100 yards of the first. This spot also had the distinction of being one of the few localities for the breeding of the Least Flycatcher (*E. minimus*) around North Wilkesboro.

It was agreed that Smith would keep this second male Traill's as well as the females (if any) under surveillance to obtain more definite evidence of breeding. This plan met with no success, although the remaining male and both females remained on location into August. Young which were heard calling could not certainly be distinguished from those of the Least. Only a mile distant, however, two additional pairs of Traill's Flycatchers were later found near Wilkesboro inhabiting alders at the edge of Cub Creek. On July 1, both members of one pair showed excitement over Smith's presence, and he heard the call notes of their young. It may conservatively be stated that this observation, coupled with the occurrence of three other pairs of these flycatchers, presents strong circumstantial evidence of the breeding of this species in North Carolina. We are indebted to Dr. Alexander Wetmore, of the U. S. National Museum, for confirming the identity of the specimen.—WENDELL P. SMITH, 911 *E. Street, North Wilkesboro, North Carolina*, and HENRY M. STEVENSON, *Biological Sciences Department, Florida State University, Tallahassee, Florida.*

A New United States Nesting Area for the Rose-throated Becard.—On May 15, 1957 my brother James and I found an old nest of the Rose-throated Becard (*Platypsaris aglaiae*) in Guadalupe Canyon, Guadalupe Mountains of southeastern Arizona. We returned to this area, a long canyon bottom with groves of large cottonwood and sycamore trees, on June 6 in the hope of locating the birds and a new nest. Although we spent two days searching the trees no becards could be found. Since this species has been noted to "skip" years at the well-known Arizona nesting locality at Sonoita Creek, it is possible that the Guadalupe birds did so this year. The new area is about 150 miles east of the Sonoita Creek area. Guadalupe Canyon runs from Mexico northeast into Arizona for some five miles and then into New Mexico. The site where the old nest was situated is only two miles from the New Mexico border. Since good becard habitat is found in New Mexico for several miles, I think it is probable that this species occasionally occurs there, though not yet recorded from that state.

The old nest was built about 20 feet above the ground, hanging from the end of a sycamore branch. The nest is pear-shaped, about two feet long and three and a half feet in circumference at the largest part (*Pl. 6*). It is made of sycamore fruits, small branches and inner bark of cottonwood trees and insect webs. The whole structure is very fragile and with Arizona's strong winds and heavy summer rains, it does not seem likely that this nest could have been more than a year old. The nest is now deposited in the Fish and Wildlife Service collection at the U. S. National Museum, where Dr. John W. Aldrich has confirmed my identification.—SEYMOUR H. LEVY, *Route 9, Box 960, Tucson, Arizona.*

Post-Copulatory Display in Fulvous and Black-bellied Tree Ducks.—The courtship display of tree ducks has been characterized as simple, resembling that of the swan (Delacour, 'Waterfowl of the World', vol. 1, p. 32, London, 1954). However F. Finn ('Bird Behaviour', p. 262, London, 1919) called attention briefly to the fact that "there is frequently a marked display after, but not before, pairing, both parties executing a step-dance in the water with one wing held aloft." So far as we know, this curious display has not been described in detail nor pictured.

The accompanying photographs illustrate post-copulatory display as regularly performed, (several times daily over a period of four months), by captive Fulvous Tree Ducks (*Dendrocygna bicolor*). Wild birds on a small pond near Rio Hondo, Texas, were observed by the authors to go through this identical procedure on several occasions in May 1957. When the photographs were made (March 1957) the female was 19 months old and the male 8 months. Both birds were obtained at an early age from the Louisiana rice fields.

Copulation has been observed by the writers only when birds were in the water. The male with quick movements grasped the back of the female's neck to assist in mounting. Seconds later, the male dismounted and was back in the water beside its mate, both treading water very fast, bringing bodies up above the surface, breasts puffed, necks arched, and with one wing lifted (usually the outer wing, the wing not next to the partner). Occasionally birds have been observed facing in opposite directions during this display.

The post-copulatory display of the Black-bellied Tree Duck (*Dendrocygna autumnalis*) was recently compared with that of the Fulvous Tree Duck on the same lake in the Lower Rio Grande Valley of Texas (Cameron County). The display of the Black-bellied Tree Duck was somewhat similar, but as observed by the writers it occurred in water which was too shallow for churning. Only once was there the slightest indication of lifting of the wing. The entire demonstration consisted of strutting for a few steps side by side, breasts puffed, heads and necks curved in an "S" shape.—Brooke Meanley, *U.S. Fish and Wildlife Service, Laurel, Maryland,* and Anna Gilkeson Meanley, *Baltimore, Maryland.*

Further History of some Bald Eagle Nest Sites in East-Central Florida.—This report is one of a continuing series each of which provides an index by which to compare the then current Bald Eagle (*Haliaeetus leucocephalus*) population in this area with that of the year 1935 when the study was initiated. Each report is based on a visit to 24 sites at which a nest was observed in 1935. These visits, with one exception, have been at intervals of five years. To refer to the most recent report see the Auk, **71:** 306–309, 1954. In 1956 a ground search of all but two of the sites (numbers 1 and 6) was made December 20, 21, and 22. On December 26, 1956, a check was made from a cub-type airplane of each of those sites where the status was not satisfactorily determined during the ground search.

In the interest of brevity, this report uses the nest site numbers and the notations given in the 1954 report. These notations are: O—occupied sites, at which there was a nest judged to contain eggs or young; A—active sites, at which at least one adult was seen but at which there was not a nest judged to contain eggs or young; and U—unoccupied sites, at which no adult was seen. Below, each nest site is referred to by its number which is followed by a notation indicating its 1956 status: 1, U; 2, O; 3, A; 4, A; 5, U; 6, U; 7, U; 8, O; 9, U; 10, U; 11, U; 12, U; 13, U; 14, U; 15, O; 16, A; 17, O; 18, O; 19, U; 20, O; 21, U; 22, U; 23, O; and 24, O. The percent, of occupied nest sites in 1956 was 33 as compared with 58 (based on the ground search or 67 including additional occupied nest sites observed from the air) in 1951, 54 in

(*Above and left*) Post-copulatory display of Fulvous Tree Duck. B. Meanley and A. G. Meanley. (*Right*) Nest of Rose-throated Becard found in Guadalupe Canyon, Arizona. S. H. Levy.

1946, 46 in 1940, and 83 in 1935. The thoroughness of the 1956 searches was excellent, probably the best in any year. The nest at site 8 had been robbed shortly before my visit as indicated by climbing iron scars on the nest tree but is listed as occupied.

In 1956 the nest at site 16 had a pair of adult eagles perched nearby and both eagle down and green pine boughs could be seen on the edge of the nest indicating that eggs probably would soon be laid. At nest site 4 an adult eagle flew silently from (or from close to) a massive nest having grass such as is used as a nest lining visible on its rim and some old droppings beneath it. Probably this site had been occupied earlier in the year but was not occupied when visited. Nest site 14 contained a new nest along the rim of which could be seen eagle down and green pine boughs and beneath which there were many droppings. This nest must have recently been occupied or possibly it was about to be occupied even though no eagle was seen at the site. The nest at site 7 was in excellent repair and there were many droppings beneath it. Since there was no eagle down about the edge of the nest, it is probable that the nesting attempt was broken up at some time early in the present breeding season.

In view of the conditions at the above four sites it is possible that 50 percent of these 24 nest sites may have been, or would have been, occupied during the 1956 breeding season. In 1951 no nest sites were listed as being active or unoccupied which had as great a probability of being occupied during the breeding season as did these four nest sites in 1956.

In 1951 two occupied nests were found at sites not originally observed to have been utilized by eagles. Each of these new sites was within two miles of one of the original 24 nest sites which was occupied also in 1956. In 1956 each of these two nest sites was again occupied. A new, additional, occupied nest site was found in 1956 within less than a mile of nest site 16 at which a nest and a pair of birds were observed. These three new nest sites may represent nest sites that were overlooked during the searches carried out in 1935 and 1940, or they may be nest sites established by eagles new to the area. If the latter is true these new eagles may represent additions to the total eagle population or they may be pairs formerly occupying other areas.

The rate of population change is not the same in all parts of the study area. One area of about three square miles in 1956 contained four occupied nests, a fifth nest with a pair of birds apparently about to lay their eggs, and a sixth nest which probably had been, or would be occupied. In 1935 there were three occupied nest sites in this area and a fourth unoccupied nest site.

In no previous five-year period in this history of this study area has there been such sweeping ecological change. It is now considered profitable in Florida to clear away from the land almost all natural plant communities. Scrub and saw palmetto may be uprooted by bulldozers. Power equipment has made draining marshes and swamps relatively speedy and has further made it practical to fill in such drained area. In this section of Florida more and more land is being cleared for agriculture, chiefly the growing of oranges, and for housing.

The Bald Eagle has a very strong attachment to its nest site. In 1956 one Bald Eagle incubated its eggs in a nest that was within a hundred yards of a number of houses and had two roads within 100 feet of it which were used often daily. A number of occupied nests were close beside orange groves. Other occupied nests have had houses built within a quarter of a mile.

Acknowledgement is gratefully made of a grant for travel expenses from the Penrose Fund of the American Philosophical Society. It is a pleasure to express my sincere thanks to the Florida Game and Fresh Water Fish Commission for providing the light plane and pilot which permitted making a search of certain sites from the air.

To summarize: a group of 24 nest sites visited in 1935 has been revisited at intervals of about five years since then to determine the percent of these 24 nest sites which is occupied. The percent of occupied nest sites for the years on which visits were made is: 1935, 83; 1940, 46; 1946, 54; 1951, 67; 1956, 33 (or possibly as high as 50).—JOSEPH C. HOWELL, *Department of Zoology and Entomology, University of Tennessee.*

Nest of the Military Macaw in Durango.—The Military Macaw (*Ara militaris*) is a conspicuous inhabitant of the pine-oak forests of the Sierra Madre Occidental in the Mexican state of Durango. On July 2, 1957, Leslie C. Drew, John K. Greer and I were collecting in these mountains at a place approximately 8800 feet in elevation, located twenty-nine miles south and twenty-eight miles west of Vicente Guerrero. On an eastward-facing slope, we found three Mexicans engaged in felling a large, dead pine tree (*Pinus* sp., probably *montezumae*). These men, had located the nest of a pair of Military Macaws in a cavity in the tree and wished to obtain the young birds to sell. As the chopping continued, the parent birds, calling loudly, either flew up and down the canyon or perched in dead pines nearby. When the tree was felled, the cavity was found to contain two crushed, white eggs with embryos no more than 100 hours old.

The nest tree measured 80 feet high and 31 inches in diameter four and one-half feet above its base. The nest cavity was situated about 60 feet above the base at a place where the tree was 22 inches in diameter. The opening of the cavity measured 11 inches wide and 6½ inches high. The cavity was 29½ inches deep and 13 inches in diameter at the widest place. There were a few green feathers and coarse sawdust as nest material on the floor of the cavity. The hole, according to the men, had been excavated by the "pitorreal" (local name for the Imperial Woodpecker, *Campephilus imperialis*) and subsequently taken over by the macaws.

Macaws are widely sought by residents of the mountains, because they are marketable as pets. The woodcutters told us that nestling birds bring as much as 25 pesos from buyers in the mountains and as much as 60 pesos in the city of Durango. Financial assistance for the field trip on which these observations were made is acknowledged from the Michigan State University Development Fund—ROLLIN H. BAKER, *Michigan State University, East Lansing, Michigan.*

Why Two Breast-Bands on the Killdeer?—When renewing acquaintance with American birds last summer, I was puzzled by the fact that the Killdeer (*Charadrius vociferus*) possesses two black breast-bands, while many other species of the genus, like the Semipalmated Plover (*C. semipalmatus*), the Piping Plover (*C. melodus*), Wilson's Plover (*C. wilsonia*), the Ringed Plover (*C. hiaticula*) and the Little Ringed Plover (*C. dubius*) have only one.

On reflection, I concluded that this must be the effect of scale. The breast-bands (and other dark markings) of these plovers are clearly cryptic in function, serving primarily to break up the bird's outline and also to assimilate its pattern to that of the background. We can presume that the scale of the visual components of the background is approximately the same for all species (except perhaps for the more uniform background of *C. melodus* and perhaps other forms). Too great an increase in absolute size of ruptive markings would make for conspicuousness. If so, a large increase in size, as in the Killdeer, cannot be adaptively met by increasing the width of a single band, but only by replacing one band by two of approximately the same width.

The surface areas of these plovers will be roughly proportional to the square of the length. The following table, based on the "Handbook of British Birds" and Peter-

son's "Field Guide to the Birds", gives the average length and the proportionate surface area (computed by squaring the lengths) of the North American and European species with complete or almost complete breast-bands.

Species	*Length in inches*	*Proportionate surface*
C. dubius	6	36
C. melodus	7	49
C. semipalmatus	7¼	52
C. hiaticula	7½	56
C. wilsonia	7¾	60
C. vociferus	10	100

The surface areas of the smaller species are about half (from less than 3/5 to 3/5) of that of the Killdeer. This fits in with the view that an approximate doubling of surface scale will necessitate a doubling of the number of breast-bands. It would be interesting to know whether there are any other cases of increase in number of ruptive-assimilative markings to meet increased absolute size.—JULIAN S. HUXLEY, F.R.S., *31 Pond Street, Hampstead, London, N. W. 3, England.*

Ed. Note.—There are several species of *Charadrius*, much smaller than the Killdeer and about the size of *C. hiaticula* or *C. wilsonia*, which also have two complete breast-bands. For example, *C. falklandicus* of southern South America and *C. tricollaris* of Africa have two black or blackish bands, and *C. bicinctus* of Australia and New Zealand has a black and a chestnut band. In respect to these, Dr. Huxley points out (*in litt.*) that research on the comparative ecology of the various species of *Charadrius* is needed to test his stimulating suggestion.

Mourning Dove Growing a New Tail.—The note on a Black-capped Chickadee (*Parus atricapillus*) growing a new tail (A. A. Saunders, Auk, 73: 560, 1956) is interesting to compare with a similar case in the Mourning Dove (*Zenaidura macroura*). This dove lost its tail completely in the Henneys' banding trap at Garden City, Long Island, N. Y., on March 11, 1940. By March 27 it had a small but perfect new tail, on April 18 the new tail was about half grown, and on April 28 the tail was just appreciably shorter than full grown. Replacement of the dove's tail took something like 48 days, against 21 days for the chickadee's.—NELLA B. HENNEY AND J. T. NICHOLS, *Garden City, N. Y.*

Hearing Ranges for Several Species of Birds.—Schwartzkopff (1955a, 1956) has published reviews on hearing in birds with a table of the hearing ranges of sixteen species as reported in the literature. An abbreviated version of the review, including the table from the earlier paper, was published in English (1955b), but as printed (Auk, 1955: 341) the table contained certain errors. Prof. Schwartzkopff has given us permission to correct and supplement his table and to include published data as to six additional species.

The upper limit of hearing in birds has been determined with reasonable certainty for only fourteen species; in general it falls within the range of 12,000–20,000 cycles per second. Only Schwartzkopff (1955a), using the very sensitive electrophysiological methods, has reported responses above 20,000 c.p.s. The upper limit reported for man is also about 20,000 c.p.s.

TABLE

HEARING RANGES FOR SEVERAL SPECIES OF BIRDS
(SUPPLEMENT TO TABLE 1, SCHWARTZKOPFF (1955b[1]))

Species	*Lower limit cs./sec.*	*Highest sensitivity cs./sec.*	*Upper limit cs./sec.*	*Method*	*Author*
Aythya valisineria	190	—	5,200	D	Edwards, 1943
Phasianus colchicus	250	—	10,500	D	Stewart, 1955
Columba livia	200	—	7,500	D	Brand and Kellogg, 1939a
	<300	1,000–4,000	—	C	Heise, 1953
Bubo virginianus	300	—	8,000	D	Edwards, 1943
Otocoris alpestris	350	—	7,600	D	Edwards, 1943
Sturnus vulgaris[2]	700	—	15,000	D	Brand and Kellogg, 1939a
	—	2,000	—	D	Trainer, 1946
Passer domesticus	675	—	11,500	D	Brand and Kellogg, 1939a
Serinus canarius	1,100	—	10,000	D	Brand and Kellogg, 1939b
Plectrophenax nivalis	400	—	7,200	D	Edwards, 1943

D = conditioning. C = cochlear potentials.

[1] In Table 1, Schwartzkopff (1955b), which is based on Tabelle 2 of Schwartzkopff's (1955a) German review, there is an error: the four cases in the column headed, Upper Limit, in which the symbol, < (less than), is used should have this symbol reversed to > (greater than).

[2] In Table 1, Schwartzkopff (1955b) the *Sturnus vulgaris* data were erroneously attributed to Granit (1941), who did not study this species.

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HUBERT FRINGS AND BETTY SLOCUM, *Department of Zoology and Entomology, The Pennsylvania State University, University Park, Penna.*

Hummingbird Feeding Preferences.—The pioneer research of Dr. Curt P. Richter of Johns Hopkins has shown that when experimental animals are offered a free choice of the elements of a diet they choose in accordance with their physiological needs and that when the needs are changed (as by an artificially produced diabetes, for example) the choices change, and that taste is the guide. In other words, what tastes best is actually best. With this in mind an experiment was set up to test the preferences of hummingbirds for the following sugars: sucrose, or common beet sugar; dextrose, or glucose; levulose, or fruit sugar; galactose, or milk sugar; maltose, or malt sugar; and saccharin, the substitute for sugar. These were made up into syrups using equal parts (by volume) of sugar and water, with the saccharin solution having a sweetness estimated to be equal to that of the sucrose solution. The experiment was made on August 15–29, 1957 at the Cherokee Ranch near Sedalia, Colorado, where a hummingbird feeding station has been maintained for a number of years.

The birds were adult and juvenile Broad-tailed Hummingbirds (*Selasphorus platycercus*) and the estimated number of individuals involved was 20–25. The feeding bottles used were half-ounce vials with a one-tenth inch hole drilled in the cap, which excluded any feeders, insect or avian, except hummingbirds. Six bottles were hung in a row on a standard at each of three stations about 100 yards apart. For several days, until the birds were accustomed to the set-up, the regular 50–50 sucrose syrup was placed in all bottles. Then in succession each of the sweeteners listed above was tested against sucrose on each stand—three bottles of sucrose alternating with three of the test syrup. Output was measured each morning, bottles refilled and the order changed. Each test syrup was used for two days. Finally all six kinds of syrup were offered together for two days. Without going into details the result in round numbers on a scale of 10 was as follows: sucrose 10; dextrose 8; levulose 5; galactose 1; maltose 0; saccharin 0. Previous experiments had indicated that a 50–50 sucrose syrup was preferred to weaker mixtures and to various solutions involving honey and orange juice. This experiment tends to confirm the conclusion that this syrup is the most desirable for hummingbird feeding.—Walker Van Riper *Denver Museum of Natural History.*

The Spelling of *Notharchus macrorhynchos hyperrhynchus* (Sclater).—Peters' "Check-List of Birds of the World" is so remarkably free of errors in the spelling of names that ornithologists tend to follow it uncritically. To prevent further perpetuation of an error in the name of a neotropical puffbird listed as "*Notharchus macrorhynchos hyperrynchus* (Sclater)" (*op. cit.*, **6**: 10, 1948), attention is called to the fact that the spelling of the subspecific name should be "*hyperrhynchus*". The omission of the middle "h" must have been a typographical error or pen-slip, for Peters cites as the original source of the name, using the correct spelling, "*Bucco hyperrhynchus* Sclater, Proc. Zool. Soc. London, pt. 23, 1855 (1856), p. 193, pl. 105". Until Peters' book Sclater's spelling was consistently used in the literature (see Cory, Field Mus. Nat. Hist., Zool Ser., 13, pt. 2, no. 2: 391, 1919).—Eugene Eisenmann, *American Museum of Natural History, New York, N. Y.*

A Yellow Mutant of the Evening Grosbeak.—On Oct. 29, 1957, in my yard at Canaan, Conn., there appeared among a flock of Evening Grosbeaks (*Hesperiphona vespertina*) that we were feeding, a single individual that was mainly so bright yellow in coloring that it stood out from the other birds very strikingly. My wife and I watched it from a distance of about ten feet, and I studied the details of its coloring with a 7x binocular.

The head, neck, back and entire underparts were a brilliant, clear yellow. Except for a few black speckles on the crown, there was nothing of the dark colors on the head and body that normal individuals show. The wings and tail were the normal black and white of a male Evening Grosbeak, though it seemed to me that the white patch in the wings was somewhat larger than in the other male birds near it. Except for the larger size and heavier bill, the bird suggested a summer male American Goldfinch (*Spinus tristis*).—Aretas A. Saunders, *Box 141, Canaan, Conn.*

Unilateral Microphthalmia in *Quiscalus quiscula* and Synophthalmia in *Mimus polyglottos*.—In the course of artificially incubating more than two thousand eggs of more than one hundred native bird species over a period of six years only two teratological specimens have come to my attention. On May 25, 1955 there hatched in my incubator a Common Grackle (*Quiscalus quiscula*) with apparently no right eye and with the upper bill crossing the normal lower one toward the right.

Closer examination showed this to be a condition known in poultry and in other non-avian animals as the sporadic malformation unilateral anophthalmia, or more strictly microphthalmia. This teratological condition, which may be caused in chickens by a genetic factor (and can be produced experimentally by anoxia during development) (Landauer, Bull. Storrs Agric. Exp. Sta., **262**: 157–159, 1951), is in this instance the more unusual since the rudimentary eye is on the right side, not the left, as is most frequent in poultry. Since the embryo normally develops with the head under the right wing with the left eye juxtaposed to the body it is thought that cases of sinistral unilateral microphthalmia are more apt to be anoxia induced phenocopies of the true genetic model than are dextral cases, such as the present one. Dr. Walter Landauer states (personal communication), "there is little doubt that the occurrence of the defect (in fowl) depends on the genotype of the bearer." The possibility suggests itself that there may be a genetic factor involved in *Quiscalus* for microphthalmia. The egg from which this specimen hatched was collected at Storrs, Connecticut, which is on the edge of the *Q. q. versicolor* and *Q. q. stonei* populations of disputed taxonomic status. This individual may have been of mixed *versicolor* and *stonei* descent. There is opened the possibility of partial genetic incompatibility between *versicolor* and *stonei* populations. The incompatability might be an illustrative example of the often mentioned, but seldom defined "partial genetic isolation" in evolution. It might involve the dilution of protective recessive modifiers of deleterious mutations already established in a population, such as Landauer (Jour. Genetics, **54**: 219–235, 1956) describes as preventing phenotypic expression of perocephaly in rumpless fowl. This specimen is normal in every other respect examined. The coronal neossoptile pterylosis is interestingly normal on both left and right sides. The hatchling peeped and elicited the normal gaping behavior, seemingly unhampered for nestling life. The chick, from a clutch of four eggs was the only anomalous one of the four. A dozen other grackle clutches incubated concurrently under the same conditions (forced draft, 88° F. wet bulb; 99.5° F. dry bulb) were normal at hatching. This egg was under artificial incubation 308 plus or minus 5 hours (13 days) probably close to the entire natural incubation period. The egg had an initial weight of 9.39 g., a volume of 8.91 cc., reached specific gravity of 1.0 eight days before hatching; the chick weighed 7.03 g. at hatching and apparently had no difficulty in opening the shell.

On May 16, 1957 I took from my incubator an egg of a Mockingbird (*Mimus polyglottos*) that was past term, and on opening it found a dead chick at a stage of development ready to hatch but slightly decomposed. The specimen had a normal lower bill and tongue but a mere undifferentiated flapr epresenting the upper bill projecting from the usual frontal region of the head. The optic capsules had grown together ventral to the rudimentary upper bill. This is a case of synophthalmia, approaching cyclopia of the genetic syndrome perocephaly (Landauer, *loc. cit.*). As with the anomalous grackle, this condition also can be produced in poultry by a genetic factor, occurring once in about ten thousand in some breeds (Landauer, personal communication), and can be phenocopied experimentally by anoxia and by biochemical injection. Synophthalmia and microphthalmia, however, are unrelated phenomena. Synophthalmia is lethal, primarily because there can be no egg tooth to effect hatching and secondarily because feeding is impossible, probably even regurgitative feeding—if indeed the parental feeding behavior would be released by such a monstrosity. The neossoptile pterylosis of this specimen is normal even to the so-called ocular pterylae, which Mockingbirds have and which Grackles have not (Wetherbee, Amer. Mus. Nat. Hist. Bull. **113**: 339–436, 1957). The egg, 2.40 cm.

by 1.89 cm. was the first and only egg found in a nest in Brentwood, Williamson County, Tennessee on April 29, 1957, 6 P. M., and was immediately put in the incubator. The egg was under artificial incubation at standard conditions during the entire incubation period (plus an undetermined post-mortem period). Other eggs (Mockingbird and others), concurrently incubated, hatched normally. It is suggested that synophthalmia is a lethal factor perhaps widespread in the Mockingbird population affecting hatchability and survival ratios.

The kindness of Dr. Walter Landauer of the Department of Animal Genetics, University of Connecticut, in checking my identifications of the anomalies is acknowledged.

It is perhaps appropriate to mention here that the anomalous condition of double yolk eggs in native birds, such as Berger (Condor, 55: 157–158, 1953) has found in the American Goldfinch (*Spinus tristis*) and in the Song Sparrow (*Melospiza melodia*), has not yet occurred in my experience.—David Kenneth Wetherbee, *New Hampshire Fish and Game Department, Concord, New Hampshire.*

First Record of the Five-striped Sparrow in the United States.—On June 18, 1957, C. D. Fisher, R. P. Kirby, and I observed a Five-striped Sparrow (*Aimophila quinquestriata*) near the Proctor Ranch, at the mouth of Madera Canyon, Pima County, Arizona (about 40 miles south of Tucson). The bird was found on the steep north side of a wash located in arid, generally flat country at the northwestern foot of the Santa Rita Mountains. The elevation was about 4700 feet. The dominant vegetation was mesquite, with a few live oaks and large cacti. The rocky ground was sparsely covered by grasses and small cacti. Small pools of water stood in the wash.

The bird was first observed by Fisher about 10:30 a.m. as it crouched on the ground behind a small clump of grass. It remained there for several minutes and then, when approached, flew into the low branches of a large mesquite about ten feet from the observers. Here the bird remained on the same perch for five minutes and sang a faint whisper song with its bill closed. The song was a high, musical, varied series of short trills and phrases, accompanied by a slight twitching of the tail. Several times, the bird also gave a single, thin, high-pitched "tseep." The sparrow continually turned its head from side to side, as if keeping an alert eye on us. Finally, it hopped to the ground, remaining in plain view until I collected it.

The specimen proved to be an adult male with an ossified skull; the testes were white and measured three by five millimeters each. The stomach was full of fine gravel and small seeds. The iris was brown, the tarsi and feet were horn-colored, the maxilla was black, and the mandible was pale blue with a black tomium. The slight amount of fat was restricted to the feather tracts.

The specimen (U.M.M.Z. 152,400) has been identified by Dr. Herbert Friedmann as *A. q. septentrionalis*. This subspecies is native to eastern Sonora, Sinoloa, western Chihuahua, and western Durango. The northernmost Mexican record of which I am aware is represented by three specimens taken by Dr. Allen R. Phillips about 9 road miles northeast of Imuris, Sonora, on the Rio Babasac, about 60 air miles south of Madera Canyon, Arizona. The present specimen is the first taken north of the U. S.–Mexican border.—Laurence C. Binford, *University of Michigan Museum of Zoology, Ann Arbor, Michigan.*

REVIEWS

Check-list of North American Birds.—Prepared by a committee of the American Ornithologists' Union. Fifth edition. American Ornithologists' Union, Baltimore, Maryland. pp. i–xiii + 1–691. 1957. Price $8.00. (Address: C. G. Sibley, Fernow Hall, Cornell University, Ithaca, N. Y). The major event of the ornithological year 1957 in America is the publication of our new Check-list, the fifth edition. I say our check-list advisedly, for while it was prepared by a committee of a few members of our Union, the raw material of which it is compounded has been gathered and published by a host of our active bird people, as well as workers abroad.

In this volume we have the inventory of all the birds of North America north of Mexico (and including Lower [now Baja] California and Bermuda), with names both scientific and common, and ranges. This is the standard reference for anyone studying or writing on North American birds, no matter what his interests.

For 18 years, since 1939, Dr. Wetmore has headed the committee that has revised the previous, fourth edition, published in 1931. The committee evaluated the pertinent literature, current and past, and here we have a synthesis of the research in taxonomy, distribution and nomenclature on American birds. Contrary claims and conflicting views have been weighed and opinions arrived at by decisive votes of the committee.

The new Check-list is a thicker book than the old one. The list proper covers in 650 pages what the old list covered in 375 pages, and the list of fossil birds, a feature of the 1931 edition has been omitted from the new one. This increase in size has been due not so much to the inclusion of more forms, of which there are only 266 more, but rather to the greater detail in which ranges are given. For instance, the Black-bellied Plover entry now covers nearly a page, instead of less than half a page. I get the impression that a reasonably complete list of the birds, including migrants, casuals and accidentals, for any state, could be done from the new check-list.

The number of forms admitted is 1686, compared with 1420 in the earlier edition. But this does not tell the whole story. Some species, accepted by the old list, have been dropped from the new one, as can be seen by reference to the hypothetical list, and some of the subspecies of the 1931 list are no longer recognised.

The additions include birds that have colonized naturally since 1931 such as the Fieldfare and the Cattle Egret; introduced species that have established themselves such as the Spotted-breasted Oriole and the Chukar partridge; strays such as the Little Egret and the Wryneck; and subspecies recently revived or described such as the western arctic Glaucous Gull and the Oklahoma Carolina Chickadee. But not all alleged new records have been accepted, and not a single valid new species has been described from this area since before 1931, the proposed warbler *Dendroica potomac* (1940) not being accepted.

Field work by our bird people has greatly increased our knowledge of bird ranges, and outstanding discoveries include those of the nesting grounds of the Bristle-thighed Curlew and Ross' Goose. There remain some further puzzles however, as the nesting grounds of the Marbled Murrelet on our Pacific coast; that of the large dark subspecies of the White-fronted Goose formerly known as the Tule Goose (? Arctic Islands); and that of the Polynesian Tattler (? in Siberia).

Other changes in this volume, compared with the old list, are many. A very welcome one is the species heading giving both technical and common names, with the range of the species as a whole outlined, followed by the ranges of each species in detail. Vernacular names for subspecies, provided in the old check-list, have disappeared, and only the common name for the whole species is given. The dis-

appearance of all subspecific vernaculars will cause some confusion, when for instance one looks in vain for the Willow Thrush, and finally discovers by comparing scientific names that it is the western subspecies of the Veery.

Some will rue the passing of such well known names as Duck Hawk (the species is now listed as Peregrine Falcon, the name by which it is widely known in the Old World). But we still have such names as Loon (not Diver), and Oldsquaw (not Long-tailed Duck). In a very few cases there is a footnote mentioning alternative names, such as Hungarian Partridge (for Gray Partridge) and Merlin (for Pigeon Hawk). Those who have lauded the stability of common names will be surprised on comparing the five editions of the check-list to see how many have changed. This is right and proper, too, for English common names are part of our language and must grow and change with it.

The arrangement and scope of orders and families is in general that of the 1931 check-list, (Wetmore's arrangement). Many changes, especially in the perching birds, have been suggested recently, but we will be able to weigh those more clearly when the dust has settled. Meanwhile carrying on the old arrangement has many practical advantages for people working with lists and curating collections of American birds.

There have been some name changes for nomenclatural reasons, and some will be very confusing, such as the generic name *Plautus* switched from the Great Auk to the Dovekie, and the changed use of *Empidonax wrightii* (see p. 346). But unless we make these changes we will find different ornithologists using the same name for different things, and worse confusion.

Most of the name changes are due to changing concepts of relationships, i.e. made because of our different interpretation of biological aspects of the birds. There is a present trend in ornithology to enlarge the scope of genera, and to restore to them their function of indicating relationship, rather than to use small genera and stress differences. This we see reflected in the new Check-list in such treatments as the merging of several small genera of pond ducks in *Anas*, *Astur* in *Accipiter*, *Penthestes* and *Baeolophus* in *Parus*, and *Corthylio* in *Regulus*. There are other cases that might equally have been acted on, notably the several small genera of egrets that might well go into *Egretta*.

Along with the broadening of the concept of the genus, is the trend to enlarge our concept of the species to include more geographical representatives. This finds expression in the new Check-list in such forms as the Florida Scrub Jay being united with the western Scrub Jays, the reduction of junco species from 8 to 7 (though all are geographical representatives and their ability to interbreed is remarkable), and in the recognition of the holarctic distribution of certain species by treating the American forms such as our Marsh Hawk and Winter Wren as conspecific with Eurasian forms. There are, of course, other examples which look similar but are kept as species, such as the Ipswich Sparrow (a geographical representative of the Savannah Sparrow).

It is not degree of morphological differences and ranges alone, but also other biological factors that are used in evaluating relationships. While some "species" of the fourth edition have metamorphosed into subspecies in the fifth, the reverse has happened when additional data were reviewed. Thus there are now two species of Dowitchers, and the Northwestern Crow emerges as a species, not a race of the Common Crow.

Perhaps the knottiest problems in outlining species limits are presented where two quite different looking forms meet with little or no overlap, and where some intergradation or hybridization may occur, at least locally, in the zone of meeting. Some

of these cases, brought into being by geological changes in the country, perhaps actually represent an intermediate stage between subspecies and species, and are thus "untidy" taxonomic units. The new Check-list has changed some of these to a conspecific treatment, as in the Gray Jay (*P. canadensis* and *obscurus*) and the Spruce Grouse (*C. canadensis* and *franklinii*), while others are kept in pairs of separate species as the flickers (*C. auratus* and *cafer*) and the orioles (*I. galbula* and *bullockii*). There are other cases which will undoubtedly receive additional field study from this point of view in the future; as the northern gulls, including the bird listed as *L. argentatus thayeri;* the northern geese, now all in *B. canadensis;* the Atlantic and Pacific Eiders; the two Brant; the Rose-breasted and Black-headed Grosbeaks; the Myrtle and Audubon's Warblers and the Eastern and Western Wood Pewees. Sometimes it seems that in cases like these the exact nomenclature is not so important as bringing out the facts, which the new Check-list has done in some cases (i.e. the flickers, juncos, orioles) by mentioning that hybridization occurs.

Dimorphism is well recognised in some species such as Screech Owl and Least Bittern, and there are some who would hold that the Blue Goose, Harlan's Hawk, and Great White Heron owe their distinctive coloration to dimorphism and do not merit the specific status now accorded them.

There are no universal objective criteria to apply as to how many subspecies to recognise. It is rather widely accepted that every moderately geographically separated population differs in some way from every other. There are some people who evidently think that if any of these differences can be found, the populations should be formally named as subspecies. Other workers think that this way lies chaos, and a stultification of taxonomy, and they would use a coarser screen in "sifting out" subspecies. The writers of the new Check-list used a fairly fine screen, but the committee has not accepted some of the very finely split millimeter races proposed in recent years.

In the treatment of clines, the new Check-list follows the common practice of allowing a subspecific name for each end of the cline, and sometimes an additional one for the central portion. Sometimes, as in the Great Horned Owl, Gray Jay, and Black-capped Chickadee certain western populations nearly if not quite duplicate some eastern ones, but are given different subspecies names without comment. However, in one case, that of the Ruffed Grouse, *B. u. umbellus*, two such populations are united under one subspecies name with a footnote mentioning the anomalous situation.

The committee has covered a tremendous amount of material, examined a great many debated points, and here we have a calm and balanced judgment. There has been perhaps a tendency to be conservative, in rejecting some proposed innovations. But nomenclature must keep in touch with the past as well as look to the future. Classification is not a finished subject. The new Check-list is one of the imposing landmarks along the road.

My main criticisms of this Check-list would concern additions to an already large volume. More comments or footnotes pointing out biological ambiguities affecting taxonomy, as is done for Arctic Loon and Yellow-bellied Sapsucker, would be welcome to researchers, even if some of the range material had to be further condensed. The second point is that the synoptic citing at least of new names proposed but not accepted since the last Check-list would have been welcomed by many taxonomists. But these are not really criticisms as much as asking for more of a good thing.—A. L. RAND.

Arctic Birds of Canada.—L. L. Snyder, with 72 illustrations in black and white by T. M. Shortt and 72 distribution maps. University of Toronto Press, Toronto;

pp. i–x, 1–300. 1957. $4.75.—The Canadian Arctic, last frontier of North America, is now being extensively penetrated and occupied by civilized man who, no doubt, will proceed to make it over in his own fashion, though this may yet take a little time to do. The era of the summer tourist is, however, just around the corner. Most of those visiting or living in the Canadian arctic nowadays are quite uninformed about the birds they encounter.

This book, prepared by the Curator of Ornithology at the Royal Ontario Museum, will undoubtedly be used primarily for identification in the field or laboratory. It provides much more substance than is to be found in the standard field guides. This is doubly important in remote areas where a reference library is not to be found around the next point of land.

The author uses an introductory chapter to establish his area (beyond the tree-line) and to touch on some of the special characteristics of arctic birds, the nature of the land they inhabit, and the particular problems they face. Two identification aids are also provided here—a key to orders, and groupings by habitat.

The main body of the book treats 72 species. Each family is skilfully delineated in a few introductory paragraphs and for each species there is an illustration, a distribution map, and a descriptive commentary that may run to three or more pages under the following headings: additional names (English and Eskimo), status, habitat, characteristics, and remarks.

Sub-arctic species that occur occasionally in the region, and other accidental or erratic avian visitors are treated separately in an appendix which thus nicely separates the improbables from the probables. A glossary of technical terms, an index, and a bibliography—which, despite its length, the author is careful to describe as 'partial' —complete the book.

While it has been a real accomplishment to bring together for the first time a compilation of the present extent of our knowledge of the birds of the region, it is perhaps equally important that he has underlined time and again how much is not known about them. The young ornithologist anxious to work on arctic birds will find many leads to ornithological pay-dirt, and the more casual traveller in the arctic will better be able to assess the significance of his bird observations. As most of the boreal gulls, sea birds, and waders regularly migrate through, or winter in more temperate regions, this book will prove useful to students who never expect to visit the arctic.

For the stay-at-home systematist and the vicarious traveller, the distribution maps will be particularly appealing. Since many of the birds treated are holarctic, and are so described in the text, it would have been most informative if at least some of these maps had indicated distribution in Alaska and Greenland, and even the old-world arctic, in order to relate the Canadian populations to the whole. However, it must be conceded that the research needed to provide such an addition might have been of a rather formidable nature and is perhaps beyond the scope of this book.

For those who like to add to their collection of bird art, this book will be a highly satisfying accession. Terence Shortt, of the Royal Ontario Museum, excels in scratch-board medium and he is at his finest here. His ability to portray the living bird in characteristic pose against a deftly authentic background leaves no doubt of his knowledge of the bird on its home grounds as well as his skill as an artist.—WILLIAM W. H. GUNN.

Observations on Birds in Southeastern Brazil.—Margaret H. Mitchell. University of Toronto Press. x + 258 pp., 1 color pl., 10 photos., 4 maps. 1957. Price, paper $4.50, cloth $5.50.—To the increasing number of persons with an ornithological

bent visiting Brazil, this book will be particularly useful. The more serious student of neotropical birds will find in it much data not previously recorded. Mrs. Mitchell lived for four years in Rio de Janeiro, and in pursuit of her avocation spent most of her spare time with binoculars and note-book, visiting the adjacent areas and the surrounding states. She advises the bird-watcher of the parks and other localities about Rio de Janeiro and São Paulo where a variety of species may be seen readily and the nature of the habitats. The book consists chiefly of an annotated list of 289 species with some notes on identification and local distribution, and—most valuable of all—many items of behavior. These nuggets of natural history data are valuable, because so little is recorded about the habits of tropical American birds. To reports of her own experience, Mrs. Mitchell frequently adds material translated from earlier literature on Brazilian birds, much of it previously scattered or in Portuguese. As there is no descriptive handbook of Brazilian birds, and as Mrs. Mitchell did no collecting, identification often presented a problem. The author did not pretend to name every species observed; with commendable frankness she indicates her doubts in many instances, stating the basis for her identification. Dr. Oliverio Pinto, dean of Portuguese ornithologists, made available the large skin collection of the São Paulo State Museum. This reviewer shares Dr. Pinto's opinion that Mrs. Mitchell has made a real contribution to the knowledge of Brazilian birds.

The book is written in an informal and pleasantly modest style. Brazilian names are given with their meaning and derivation; these names are often pungent and even humorous. Absent any list of English names for South American species, the author felt reluctantly obliged to accept the subspecific designations applied by the "Catalogue of Birds of the Americas" to the local races—though these sometimes obscure recognition of wide-ranging birds. The work closes with a glossary of Brazilian terms, a good bibliography, and a well-prepared index.—E. Eisenmann.

Key-List of the Palaearctic and Oriental Passerine Birds.—Col. Owen E. Wynne. 1956. (T. Buncle & Co. Ltd., Arbroath, Scotland. 12/6). 136 pp. This handy booklet lists each species with a very brief indication of the species range, names the subspecies (giving their authors and date of description, but without ranges), and supplies an English name for each species. The author states frankly that this is a compilation and makes no claim that his work is a conventional check-list. Nevertheless, it was compiled with care, is modern in its systematic groupings, and in practice has proved to be a very useful "aide memoire". The paper appends a modest but serviceable bibliography of recent major distributional works, and a list of the authors who described the birds included, with years of birth, and of death if no longer alive, referring to biographical sources.—C. Vaurie.

Prontuario de la Avifauna Española.—Francisco Bernis. Sociedad Española de Ornitología, Madrid, Spain. 77 pp. 1955. Price 30 pesetas.—From the viewpoint of ornithology Spain is the most interesting and the least known country in western Europe. This check-list covers the entire Hispanic Peninsula (including Portugal), as well as the Balearic and Canary Islands. The nomenclature now current in Europe is followed, but synonyms used in earlier works on Spanish birds are mentioned. For each species and subspecies range and status within the area (whether breeding, migratory, or casual) are indicated in very abbreviated form. A Spanish name is supplied for each species—generally brief, and usefully descriptive or suggestive. The names, though many are new, are assured popular dissemination by adoption in the recently published Spanish edition of the internationally successful European field guide by Peterson, Mountfort and Hollom.

The 'Prontuario' is commended to those providing Spanish names for Latin-American birds—a task required because so few New World species have developed Spanish vernaculars of consistent application. The hardest problem is to select Spanish *group* names. Adoption of the 'Prontuario' group names for the same groups in the New World would be a long step towards the establishment of uniform Spanish bird names for Latin-America—just as we have uniform English names for the United States and Canada. The 'Prontuario' also sets a standard of brevity in the construction of specific names. It consistently uses compound descriptive adjectives (much as in English), rather than the longer, more formal, adjectival phrases often seen; for example, the Red-backed Shrike is *Alcaudón Dorsirrojo*, not *'de Dorso Rojo'*. The carefully chosen vernacular names of the 'Prontuario' reflect a recognition of their importance in promoting popular interest in birds.—E. EISENMANN.

Acta XI Congressus Internationalis Ornithologici. Basel 29 V.-5 VI. 1954.—Sir Landsborough Thomson, president; Adolf Portmann and Ernst Sutter, editors. Birkhauser Verlag, Basel, Switzerland. 680 pp., 12 pl., many figs. 1955. Price, 36 Swiss francs. This well-printed and illustrated volume of the Proceedings of the Eleventh International Ornithological Congress, held in 1954, will prove of exceptional interest to students of birds.

The many important contributions in the 110 separate articles include the proceedings of the Congress; the reports of symposia on visible migration, on hearing and analysis of voice, and on the biology of penguins; several general papers of broad significance; and a large number of highly varied contributions presented in the meetings of the sections on Morphology and Paleontology, Systematics and Behaviour, Migration, and Folklore. More than half of the articles are in English; almost all the others are in French or German, sometimes with English summaries. The volume as a whole is a valuable and varied presentation of current ornithological studies. It should stimulate attendance at the next International Ornithological Congress, to be held at Helsinki in June 1958.

International Union for Conservation of Nature and Natural Resources. Proceedings and Papers of the Sixth Technical Meeting held at Edinburgh in June, 1956. xxii + 265 pp. $3.75. (Society for the Promotion of Nature Reserves and The Nature Conservancy; procurable from the latter, 19 Belgrave Square, London, s.w. 1.) This book includes over eighty papers (or summaries) on a variety of subjects, delivered at sessions devoted to the following general themes: management of nature reserves, biological consequences due to the presence of myxomatosis, rehabilitation of areas biologically devastated by human disturbance, relation of ecology to landscape planning.

RECENT LITERATURE

EDITED BY FRANK McKINNEY

Anatomy and Embryology

Berger, A. J. 1957. On the anatomy and relationships of *Fregilupus varius*, an extinct starling from the Mascarene Islands. Bull. Amer. Mus. Nat. Hist., **113**, art. 3: 231–272. Concludes that *Fregilupus* was probably not a starling, after a comparative study of pterylosis, osteology and myology.

Ferguson, T. M., R. H. Rigdon, and J. R. Couch. 1957. Thyroid in B_{12} deficient chick embryos. Endocrin., **60**: 13–21.—An histological description of the thyroid gland.—H. C. S.

Thomsett, D. H. 1957. Casts of the pulmonary system of birds. Ibis, **99**: 614–620.—A simple apparatus for making transparent synthetic resin casts of the pulmonary system is described.—R. F. J.

Wetherbee, D. K. 1957. Natal plumages and downy pteryloses of passerine birds of North America. Bull. Amer. Mus. Nat. Hist., **113**, no. 5: 345–436. Most passerines are not naked when hatched, but show scanty, definitely distributed, downy tufts, the specialized tips of a few contour feathers. The downy tufts of 74 species were examined and tabulated as to distribution, number, length, and variation. Published and unplublished data on other species (often conflicting) are compiled; German sources are quoted, *without translation*. In certain families, e.g. Corvidae and Hirundinidae, some species are hatched completely naked while others have down; within genera the data indicate basic similarities, as well as specific (and also individual) differences. Included are drawings, one for each family, entitled "Basic neossoptile pterylosis", stated to be "qualitative abstractions". The usefulness of these drawings is greatly impaired by failure to state which (if any) species is depicted; no "norm" for a family can be assumed, as only a few species of each (sometimes only one or two) were examined, there are marked differences among genera and even species, and some of the families are probably polyphyletic.—E. E.

Behavior

Andrew, R. J. 1956. Some remarks on behaviour in conflict situations, with special reference to *Emberiza* spp. Brit. Journ. Animal Behav., **4**: 41–45.—Conflict situations arise when tendencies to perform incompatible behavior patterns occur simultaneously. Instead of saying that fear and aggression are conflicting, it is better to specify the responses which are incompatible. Intention movements of flight are discussed. Examples of "compromise behavior" are given; a single pattern may simultaneously express two incompatible tendencies. A number of apparently irrelevant behavior patterns—cooling responses occurring during fear—are thought not to be displacement activities.—F. M.

Andrew, R. J. 1956. Normal and irrelevant toilet behaviour in *Emberiza* spp. Brit. Journ. Animal Behav., **4**: 85–91.—Activities related to care of the body surface are described. Peripheral stimuli such as foreign material on the feathers, disarranged feathers, etc. are important in causing these behavior patterns and the reactions are often reflex-like. Examples of the irrelevant occurrence of activities such as feather-settling are given; they are frequent in conflict situations.—F. M.

Andrew, R. J. 1956–57. The aggressive and courtship behaviour of certain Emberizines. Behaviour, **10**: 255–308.—A detailed description deals with threat postures and calls, soliciting and copulation, courtship displays, pair-formation,

song, paired behavior, sexual chases, and reproductive fighting. The origin and motivation of the behavior patterns are discussed. On the basis of this important comparative study, conclusions are drawn on relationships. Four rather separate groups are distinguished: (1) *Emberiza schoeniclus* and *E. cia*, (2) *Calcarius lapponicus* and *Plectrophenax nivalis*, (3) *E. calandra* and *E. bruniceps*, (4) *E. citrinella*, *E. hortulana*, and *E. cirlus*.—F. M.

FISHER, H. I. 1957. Footedness in Domestic Pigeons. Wilson Bull., **69**: 170–177.—Experiments to measure the landing force of *Columba livia* revealed that seven pigeons used the right foot predominantly, three the left foot, and one favored neither. There were some individual changes in footedness.—J. T. T.

HALE, E. B. 1956–57. Breed recognition in the social interactions of domestic fowl. Behaviour, **10**: 240–254.—Experiments showed that in small flocks containing different breeds one breed was dominant over the other. A single brief experience with a member of another breed had a profound influence on subsequent reactions to members of this breed. Experimental plumage coloring did not affect recognition of members of dominant breed by subordinate breed birds, but did affect individual recognition within a breed.—F. M.

HAMILTON, W. J., III. 1957. Blue-winged Teal [*Anas discors*] parasitized by Brown-headed Cowbird [*Molothrus ater*]. Wilson Bull., **69**: 279.

HINDE, R. F., W. H. THORPE, and M. A. VINCE. 1956. The following response of young coots and moorhens. Behaviour, **9**: 214, 242.—Experiments with hand-raised *Gallinula chloropus* and *Fulica atra* showed that following can be evoked by a variety of moving objects. Birds trained to follow one model would also follow other models. It is suggested that increase in the tendency to flee during the first few days of life may be an important factor limiting the "sensitive period" for the establishment of the following response. Learning occurs when the bird follows the moving object. "Imprinting" is not fundamentally different from other types of learning.—F.M.

MEYERRIECKS, A. J. 1957. "Bunching" reaction of Cedar Waxwings [*Bombycilla cedrorum*] to attacks by a Cooper's Hawk [*Accipiter cooperii*]. Wilson Bull., **69**: 184.

MOYNIHAN, M. 1956. Notes on the behavior of some North American gulls. I. Aerial hostile behavior. Behaviour, **10**: 126, 178.—Detailed descriptions of the aerial hostile patterns of *Larus delawarensis*, *L. pipixcan*, *L. argentatus smithsonianus*, *L. californicus*, *L. atricilla*, and *L. philadelphia* are given and comparisons are drawn between the behavior of these species and that of the european *L. r. ridibundus* and *L. minutus*. While some of these behavior patterns occur in only one species, most of them have homologues in each species studied. The aerial reactions of the hooded gulls are performed much more frequently than those of the Ring-billed and Herring Gulls.—F.M.

SICK, H. 1957. Anting by two tanagers in Brazil. Wilson Bull., **69**: 187–188.—*Tangara cyanicollis* and *T. cyanoventris*.

THOMAS, J. W. 1957. Anting performed by Scaled Quail [*Callipepla squamata*]. Wilson Bull., **69**: 280.

WHITAKER, L. M. 1957. Lark Sparrow oiling its tarsi. Wilson Bull., **69**: 179, 180.—A captive *Chondestes grammacus* smeared with its bill oil from its oil gland on its tarsi and feet.—J.T.T.

WHITAKER, L. M. 1957. A résumé of anting, with particular reference to a captive Orchard Oriole. Wilson Bull., **69**: 195–262.—The anting behavior of a captive *Icterus spurius* is described in detail and illustrated by several photographs. The

literature on anting is summarized and there is a bibliography covering eleven pages, altogether providing a valuable review of the subject. Active anting involves anointing the feathers or body by ants held in the bill; passive anting is accomplished by allowing ants to invade the plumage. Birds seem to have used only species of ants that either spray or exude fluids that cause a burning or heating sensation. The region surrounding the vent is the area most frequently anointed in active anting. These related observations suggest that birds are pleasurably, possibly sexually, stimulated by anting.—J.T.T.

WILLIAMS, C., and W. H. MCGIBBON. 1957. The relationship of the various mating behavior activities of the male domestic fowl. Poultry Science, **36:** 30–33.

DISEASES AND PARASITES

COHEN, J., and P. G. 'ESPINASSE. 1957. A basal-cell carcinoma in the fowl. Nature, **179:** 207–208.

FALLIS, A. M., and D. M. WOOD. 1957. Biting midges (Diptera: Ceratopogonidae) as intermediate hosts for Haemoproteus of ducks. Canad. Journ. Zool., **35:** 425–435.—Biting midges (*Culicoides* sp.) are suitable intermediate hosts for *Haemoproteus nettionis* in domestic ducks.—F.M.

GLASGOW, L. L., and R. HENSON. 1957. Mourning Dove nestlings infested with larvae of *Philornis*. Wilson Bull., **69:** 183–184.—Two nestling *Zenaidura macroura* were parasitized by 17 and 26 maggots of *Philornis* (Muscidae).—J.T.T.

DISTRIBUTION

ALLOUSE, B. E. 1957. On a recent ornithological excursion in Iraq made by Dr. Makatsch. (May 28–June 9, 1957). Iraq Nat. Hist. Mus. Publ. **13:** 17–21.—Notes on 35 species.

ALLOUSE, B. E. 1957. On a collection of birds from Mosul, Iraq. Bull. Coll. Arts Sci., Baghdad, **2:** 162–181.—List of 91 species, based on the collection in the Mosul Museum of Natural History.

AMADON, D. and A. BASILIO. 1957. Notes on the birds of Fernando Poo Island, Spanish Equatorial Africa. Amer. Mus. Novit. no. 1846: 1–8.

BOSWELL, C., and P. NAYLOR. 1957. A preliminary note on four birds which appear to be new to the Iraq list. Iraq Nat. Hist. Mus. Publ. **13:** 16.

ELLIOTT, H. F. I. 1957. A contribution to the ornithology of the Tristan da Cunha group. Ibis, **99:** 545–586.—Natural history and taxonomy of the oceanic and terrestrial avifauna of this south Atlantic island group.—R.F.J.

GINÉS, HNO., and YÉPEZ T., G. 1956. Avifauna de las Islas, pp. 68–77, *in* El Archipiélago de los Roques y La Orchila. Soc. Cienc. Nat. La Salle (Caracas, Venezuela).—(In Spanish.) During a general scientific survey of this island group located off the Caribbean coast of Venezuela, made at irregular intervals between 1940 and 1954, 46 kinds of birds were collected on Los Roques, and 17 on Orchila. The total list for the entire group is 48 forms. An abundant lizard, *Cnemidophorus lemniscatus nigricolor* Peters ate the eggs of the Brown Booby, whenever these were left unprotected, breaking them by pushing them off the rocky ledges where the nests were located. *Coereba flaveola lowii* Cory is restricted to Los Roques. Another local subspecies, *Dendroica petechia obscura* Cory, ranges to an adjacent island group, Las Aves. The Golden Warbler of Orchila is listed as *Dendroica petechia rufopileata* Ridgway, a race that has a wide insular distribution from Aruba and Curaçao to Margarita Island.

SERLE, W. 1957. A contribution to the ornithology of the eastern region of Nigeria. Ibis, **99**: 371–418, 628–685.—An annotated list stressing ecology and taxonomy.—R.F.J.

ZAHAVI, F. 1957. The breeding birds of the Hula swamp and lake (northern Israel). Ibis, **99**: 600–607.—A check-list with notes on habitats and on habitat selection in certain sylviids.—R.F.J.

ZIMMERMAN, D. A. 1957. Notes on Tamaulipan birds. Wilson Bull., **69**: 273–277.—Field observations on 27 species.—J.T.T.

ECOLOGY AND POPULATION

DORST, J. 1957. The puya stands of the Peruvian high plateaux as a bird habitat. Ibis, **99**: 594–599.—An examination of *Puya raimondii* associations of the Peruvian *altiplano* as avian habitats.—R. F. J.

HAGAR, D. C., JR. 1957. Nesting populations of Red-tailed Hawks and Horned Owls in central New York State. Wilson Bull., **69**: 263–272.—In a 52-square-mile area in Madison County, N. Y., through four nesting seasons, the nesting and non-nesting *Buteo jamaicensis* and *Bubo virginianus* were located and observed. Density, interspecific intolerance, nesting success, and other conclusions are reported.—J. T. T.

TURČEK, F. J. 1957. The bird succession in the conifer plantations on mat-grass land in Slovakia (ČSR). Ibis, **99**: 587–593.—Bare pasture had the lowest number of birds but largest avian biomass, conifer plantations 1–5 years old an intermediate number of birds but smallest biomass, and plantations 6–20 years old the most birds but an intermediate biomass.—R. F. J.

GENERAL BIOLOGY

DE CARVALHO, C. T. 1957. Notas ecológicas sôbre *Volatinia jacarina* (Passeres, Fringillidae). Bol. Mus. Paraense Emilio Goeldi, n.s. Zoologia, no. 2: 1–10. Belém, Pará, Brazil. Nesting and general behavior of the Blue-black Grassquit. (In Portuguese; English summary.)

DE CARVALHO, C. T. 1957. A nidificação do *Turdus l. albiventer* Spix (Passeres, Turdidae). Bol. Mus. Paraense Emilio Goeldi, n.s. Zoologia, no. 4: 1–13. Nesting and general behavior of *T. leucomelas albiventer*. (In Portuguese; English summary.)

DE CARVALHO, C. T. 1957. Notas sôbre a biologia do *Ramphocelus carbo* (Passeres, Thraupidae). Bol. Mus. Paraense Emilio Goeldi, n.s. Zoologia, no. 5: 1–19. Breeding biology of the Silver-beaked Tanager. (In Portuguese; English summary.)

NOVAES, F. C. and C. T. DE CARVALHO. 1957. Observações sôbre a nidificação de *Glaucis hirsuta* (Gmelin)—Trochilidae Aves. Bol. Mus. Paraense Emilio Goeldi. Nova serie. Zoologia, no. 1: 1–11. Belém, Pará, Brazil. Observations on the nesting of the hummingbird *Glaucis hirsuta*. (In Portuguese; English summary.)—E. E.

THOMSON, A. L., and R. E. MOREAU. 1957. Feeding habits of the palm-nut vulture *Gypohierax*. Ibis, **99**: 608–613.—*G. angolensis* feeds partly on fishes and also uses the oil-rich fruits of the palm *Elaeis*; it probably prefers the latter to meat.—R. F. J.

VAN BREE, P. J. H. 1957. Variations in length and breadth of eggs from a colony of black-headed gulls (*Larus r. ridibundus* Linnaeus) on the island of Texel. Beaufortia, Zool. Mus. Amsterdam, **5**, no. 67: 245–255. Statistical analysis of 1246 eggs.

Management and Conservation

Lamb, G. H. 1957. The Ivory-billed Woodpecker in Cuba. Pan-American Section, International Committee for Bird Preservation. Research Rept. no. 1: 1–17. (Obtainable from S. D. Ripley, Peabody Mus.Nat. Hist., Yale Univ., New Haven, Conn.) The last remnant, in northeastern Oriente Province, amounted to six pairs in 1956. The birds survive only in pine forest on lateritic soil, where large dead pines persist. Deforestation has been the main cause of extirpation. Valuable account of distribution, feeding and other aspects of behavior. Suggestions for saving the woodpecker from extinction.—E. E.

Lamb, G. H. 1957. On the endangered species of birds in the U. S. Virgin Islands. Pan-American Section, International Committee for Bird Preservation. Research Rept. no. 2: 1–5. Colonial sea-birds and their nesting sites in the Virgin Islands are listed. Sites are tiny cays, owned by government, but unprotected from regular commercial exploitation for eggs and young. It is urged that Bureau of Sport Fisheries and Wildlife be placed in charge. Lack of protection has reduced sole breeding colony of White-crowned Pigeons to 300.—E. E.

Migration and Orientation

Bagg, A. M. 1957. The changing seasons. A summary of the spring migration. Audubon Field Notes, **11**: 312–325.—An analysis of the 1957 spring migration in the light of weather conditions. 26 weather maps show the position of highs, lows, and airflows on the key days. Heavy diurnal migration across the Gulf of Mexico was seen in progress and further evidence was obtained on the time taken by migrants to make the crossing. Detailed regional reports on migration complete this issue (p. 325–377) and these should be used in conjunction with the summary. —F. M.

Bellrose, F. C. 1957. A spectacular waterfowl migration through central North America. Illinois Nat. Hist. Survey, Biol. Notes No. **36**, Urbana, pp. 24.—A detailed account, compiled from reports of many observers, of the mass migration of waterfowl which occurred on November 1–3, 1955. This flight was very well documented since census figures are available for a number of areas in the Mississippi flyway just before and after the migration. Details are given of the direction, speed, and altitude of the flight and of the species involved. Weather conditions are analysed: the flight is thought to have been initiated by a southward flow of a mass of Continental Arctic air which resulted from low pressure areas in Canada.—F. M.

Miller, L. 1957. Some avian flyways of western America. Wilson Bull., **69**: 164–169.—Migrating birds have been observed flying through mountain passes, either fault lines or erosion gaps, in California and Arizona. Thus they avoid climbing over mountains and so conserve energy.—J. T. T.

Physiology

Bartholomew, G. A., and T. J. Cade. 1957. The body temperature of the American Kestrel, *Falco sparverius*. Wilson Bull., **69**: 149–154.—Continuous temperature records were acquired from thermocouples fastened in different parts of the body of ten individuals. At normal environmental temperatures, there is a diurnal cycle of body temperatures fluctuating around 41°C. At air temperatures up to 48°C, the body (cloacal) temperature rose to 44°C with no permanent damage to the birds.—J. T. T.

BERNSTORF, E. C. 1957. Difference in response of the capon comb to intraperitoneally and subcutaneously injected testosterone propionate. Endocrin., **60:** 173–184.

FERGUSON, T. M., J. B. TRUNNELL, B. DENNIS, P. WADE, and J. R. COUCH. 1957. The influence of vitamin B_{12} deficiency on the uptake of I^{131} by the thyroid gland in adult and embryonic chickens. Endocrin., **60:** 28–32.—The uptake of I^{131} is decreased.—H. C. S.

GLICK, B. 1957. Experimental modification of the growth of the bursa of Fabricius. Poultry Science, **36:** 18–23.

HIMENO, K., and Y. TANABE. 1957. Mechanism of molting in the hen. Poultry Science, **36:** 835–842.

KARE, M. R., R. BLACK, and E. G. ALLISON. 1957. The sense of taste in the fowl. Poultry Science, **36:** 129–138.

KIRKPATRICK, C. M. 1957. Bobwhite weight gains on different light-dark cycles. Poultry Science: **36:** 989–993.

LOFTS, B., and A. J. MARSHALL. 1957. The interstitial and spermatogenetic tissue of autumn migrants in southern England. Ibis, **99:** 621–627.—Autumnal recrudescence of testes was demonstrated in adult passerine migrants. Cholesterol material was present in testes, and since this is probably the androgenic precursor, autumnal sexual behavior (even in migrants) is probably caused by this.—R. F. J.

MELLEN, W. J., and B. HARDY, JR. 1957. Blood protein-bound iodine in the fowl. Endocrin., **60:** 547–551.—The PBI level in chickens and ducks was consistently lower than in mammals.—H. C. S.

NORRIS, R. A., C. E. CONNELL, and D. W. JOHNSTON. 1957. Notes on fall plumages, weights, and fat condition in the Ruby-throated Hummingbird. Wilson Bull., **69:** 155–163.—A September concentration of *Archilochus colubris* in South Carolina was used to make studies of these and other characteristics.—J. T. T.

POLIN, D., and P. D. STURKIE. 1957. The influence of the parathyroids in blood calcium levels and shell deposition in laying hens. Endocrin., **60:** 778–784.—Parathyroids play a role in regulating plasma calcium concentration and thus indirectly influence shell deposition.—H. C. S.

POLIN, D., P. D. STURKIE, and W. HUNSAKER. 1957. The blood calcium response of the chicken to parathyroid extracts. Endocrin., **60:** 1–5.—The blood calcium increased, especially in laying hens.—H. C. S.

TAXONOMY

AMADON, D. 1956. Remarks on the starlings, family Sturnidae. Amer. Mus. Novit., no. 1803: 1–41. Amadon recognizes 27 genera and 110 species of starlings in his treatment for the "Check-list of birds of the world". Here he outlines the reasons for his conclusions in the controversial situations and offers comments on relationships and evolution.—E. E.

AMADON, D. 1957. Remarks on the classification of the perching birds, [order Passeriformes]. Proc. Zool. Soc. Calcutta, Mookerjee Memor. Vol.: 259–268. The bases and difficulties of phylogenetic classification in passerine birds are discussed. The families of Oscines are considered to fall into three groups, with the corvids in the most primitive group, the muscicapids in the intermediate group, and the emberizines in the most recent group. The arrangement of families is closer to that of Wetmore (Smith. Misc. Coll., 117, no. 4: 1–122, 1951) than to that proposed some years ago by Mayr and Amadon (Amer. Mus. Novit., no. 1496: 1–42, 1951).—E. E.

ANDREW, R. J. 1956. Intention movements of flight in certain passerines, and their use in systematics. Behaviour, **10**: 179–204.—Intention movements of flight—incomplete take-offs, wing-flicks, and tail-flicks—are described in *Emberiza* spp. The detailed form of these tail movements is compared in about 100 species (chiefly Emberizines, Richmondenines, Carduelines, and Ploceids) and this character is shown to be useful in defining relationships. The Emberizinae are significantly distinguished from nearly all the other systematic groups; *Fringilla* is thought to be most closely related to the Carduelinae; the Estrildinae are a natural and somewhat isolated group. The function of the pre-flight tail-flicks is to make the bird conspicuous to other members of the species.—F. M.

DELACOUR, J. and C. VAURIE. 1957. A classification of the Oscines (Aves). Los Angeles Cty. Mus. Contrib. Sci., no. 16: 1–6. Reconsideration is urged of the decision reported by Mayr and Greenway (Breviora, 58: 1–11, 1956) to place the corvine assemblage at the end of the Oscines, rather than near the beginning, in the forthcoming continuation of Peters' Check-list. The writers prefer Wetmore's sequence (which Peters had proposed to follow), with some modifications. A proposed systematic sequence is attached of families and subfamilies, which resembles that of Amadon (1957, *supra*) in general approach but differs in some respects.—E. E.

RAND, A. L., and R. L. FLEMING. 1957. Birds from Nepal. Fieldiana, Zool., **41**: no. 1: 1–218.—Report on a series of collections made by the junior author from 1949 to 1954, comprising some 2500 specimens representing 490 species and subspecies. Collections were made from far western to eastern Nepal.—M. A. T.

VAURIE, C. 1956–1957. Systematic notes on Palearctic birds. No. 24 Ploceidae: the genera *Passer*, *Petronia*, and *Montifringilla*. No. 25 Motacillidae: the genus *Motacilla*. No. 26 Paridae: the *Parus caeruleus* complex. Amer. Mus. Novit. no. 1814: 1–27; no. 1832: 1–16; no. 1833: 1–15. The latest papers of an important series, begun in 1953, treating problems of taxonomy and distribution in the Passeriformes of the Palearctic. These meticulous and informative studies explain the bases for the conclusions embodied in Vaurie's forthcoming book on Palearctic passerines.—E. E.

WARNER, D. W., and B. E. HARRELL. 1957. The systematics and biology of the Singing Quail, *Dactylortyx thoracicus*. Wilson Bull., **69**: 123–148, 1 color plate by G. M. Sutton.—This quail inhabits a number of forest types and several disjunct areas in Mexico. Its behavior and habits are described. The species is split into 18 subspecies, eight new ones being described here.—J. T. T.

NOTES AND NEWS

1958 Meeting of A. O. U.

The American Ornithologists' Union will meet in New York in 1958 on the occasion of the Union's 75th Anniversary. The meeting is jointly sponsored by the Linnaean Society of New York, the National Audubon Society, the New York Zoological Society, and the American Museum of Natural History. The scientific sessions will be held in the American Museum on Wednesday, Thursday, and Friday, October 15–17. The business sessions will be held on Tuesday, October 14, and field trips will be arranged for Saturday and Sunday, October 18 and 19. The New Yorker Hotel, 34th Street and Eighth Avenue, will serve as meeting headquarters, and the Annual Banquet will be held there on Friday evening. It is hoped that on the occasion of this, the 75th Anniversary of the Union, many of our members from abroad as well as from America will be able to attend.

Chapman Memorial Fund Awards

Awards for ornithological research are made in April of each year by the Frank M. Chapman Memorial Fund Committee of the American Museum of Natural History, New York. Applications should be received by March 15. Awards were made in 1957 for the following projects:

Walter Bock, Harvard University: The taxonomic importance of the pterylography of songbirds.

Gerald Collier, University of California: The ecology of the Red-winged Blackbird and the Tricolored Blackbird.

Robert W. Dickerman, University of Minnesota: The systematics of the Song Sparrow in Mexico.

William G. George, University of Arizona: The significance of the hyoid bones in classifying birds.

William J. Hamilton III, University of California: The sensory basis of migration in the Pintail Duck.

Robert H. MacArthur, Yale University: The ecology of the eastern warblers.

Roger S. Payne, Cornell University: The auditory responses of owls.

Gerard F. van Tets, University of British Columbia: The breeding biology and behavior of three species of Pacific Coast cormorants.

Color Plates in 'The Auk'

The plate of the Tropical Parula Warblers published in the October, 1957 issue was made possible through the generosity of Mr. Maurice A. Machris, who not only financed the work, but gave Mr. Stager, the author of the paper illustrated, and Dr. Storer, the then Editor, a free rein in selecting the artist and the subject of the plate.

Ornithology would be served and the attractiveness of 'The Auk' greatly enhanced were it feasible at frequent intervals to include color plates of birds that have never, or rarely, been depicted. Unfortunately the expense precludes this, except when some generous individual offers to supply the means.

The Assembly and Seventh Technical Meeting of the International Union for the Conservation of Nature and Natural Resources will be held in Athens, Greece, September 11–19, 1958. Inquiries should be made of the Secretariat, 31 Rue Vautier, Brussels, Belgium.

Post-Doctoral Fellowship at Yale

Notice has been received of the creation of a new Post-Doctoral Fellowship in the Biological Sciences at Yale University. Among the fields particularly marked out for recognition is that of Systematic Studies in Zoology including Ornithology. Inquiries should be directed to the Chairman of the Committee, Professor G. Evelyn Hutchinson, Osborn Zoological Laboratory, Yale University, New Haven, Conn.

Student Membership Awards for 1958

Selected by the A.O.U. Committee on Student Membership Awards

Gene Doyle Amman, Colorado State University, Fort Collins, Colorado
Eugene Dale Bawdon, San Jose State College, San Jose, California
Joseph Vern Beckett, Kent State University, Kent, Ohio
Ruth Ann Berberian, Cornell University, Ithaca, New York
Roger Barnum Clapp, Cornell University, Ithaca, New York
Robert J. Drake, University of Arizona, Tucson, Arizona
Charles Donald Easterberg, Evanston Township High School, Evanston, Illinois
Richard Cullen Funk, Colorado State University, Fort Collins, Colorado
William Gordon George, University of Arizona, Tucson, Arizona
Robert Charles Gray, University of New Brunswick, Fredericton, New Brunswick
Duade N. Griffin, Oklahoma State University, Stillwater, Oklahoma
P. Tom Griffith, College of Wooster, Wooster, Ohio
Robert Bruce Hamilton, University of Tennessee, Knoxville, Tennessee
J. Hill Hamon, University of Florida, Gainesville, Florida
William Richard Hawkins, Southern Illinois University, Carbondale, Illinois
Jack Hensley, University of Arizona, Tucson, Arizona
Frank August Iwen, University of Wisconsin, Madison, Wisconsin
Lawrence Graham Isard, Kent State University, Kent, Ohio
Larry Jim Kelts, Cornell University, Ithaca, New York
Jean Hulme Linford, University of Utah, Salt Lake City, Utah
Duncan Weet Mackenzie, Cornell University, Ithaca, New York
Nancy Anne McAllister, University of Michigan, Ann Arbor, Michigan
Alice Lois McCollough, Judson College, Marion, Alabama
Kerry Alexander Muller, San Diego State College, San Diego, California
Douglas Humphreys Pimlott, University of Wisconsin, Madison, Wisconsin
Carol Jean Preston, William Jewell College, Liberty, Missouri
Robert James Schaefer, Harvard College, Cambridge, Massachusetts
Robert Wayne Schneider, Colorado State University, Fort Collins, Colorado
Dennis Rodney Sheets, Yale University, New Haven, Connecticut
John Dudley Shreve, University of Miami, Coral Gables, Florida
Judith Stenger, University of British Columbia, Vancouver, British Columbia
Asa Thoresen, Oregon State College, Corvallis, Oregon
W. Glenn Titus, Colorado State University, Fort Collins, Colorado
James Clare Vanden Berge, Michigan State University, East Lansing, Michigan
Gerard Frederick Van Tets, University of British Columbia, Vancouver, British Columbia
James Russell Werner, Arizona State College, Tempe, Arizona
Robert G. Yoder, University of Arizona, Tucson, Arizona

OBITUARY

Sir Norman (Boyd) Kinnear, Honorary Fellow of the American Ornithologists' Union, died on 11 August, 1957. Kinnear was born in Scotland on 11 August, 1882, and was descended from the famous naturalist, Sir William Jardine. He attended Trinity College, Glenalmond, and signified his great interest in birds and natural history by serving as a Volunteer Assistant at the Royal Scottish Museum in Edinburgh from 1905 to 1907.

In 1907 he was offered the post of Assistant Curator at the Bombay Natural History Society and thus had a chance to go to India, a country he loved and on the subject of whose birds he continued to be an authority until his death. In 1913 he married Gwendolen Beatrice Millard, whose family had long been associated with India and with the development of the Bombay Natural History Society. The Kinnears have two daughters. In 1919 Kinnear returned to England and joined the staff of the British Museum (Natural History), serving first as an Assistant in Zoology, finally rising to be Director of the Museum from 1947 until his retirement in 1950 when he was knighted. He served in various capacities in ornithological societies in Great Britain, and was President of the British Ornithologists' Union from 1943 until 1948. The first post-War ornithological meeting in Europe, that of the B.O.U. at Edinburgh in 1947, was held under his Chairmanship.

Kinnear's specialty was the study of Indian birds. He was the author of numerous papers, many of them with his close friend, Hugh Whistler. He edited a "Handbook" of Indian Birds, prepared originally by Whistler, through a number of editions. His knowledge of the birds of Southern Asia was vast. He was also greatly interested in the historical development of scientific knowledge in that area and in the many persons who had played their parts in it. Shortly before his death he had contributed two articles to the Journal of the Bombay Natural History Society on the history of vertebrate zoology in India. He continued to be, in addition, Chairman of the British Section of the International Committee for Bird Preservation.

Sir Norman was a quiet, gentle man, happy to share his interests or knowledge with whomsoever should seek it, constantly anxious to be of aid to younger workers. His opinions were positive and decided, but not dogmatic. In January, 1957, he fractured his right leg and lay for over two months in hospital, but nothing daunted, was getting about on crutches, going regularly to London to work at the Museum. He never complained, and continued to be interested in all sorts of ornithological subjects until his sudden and unexpected death of a lung clot. He was a fine man, always helpful, and of him it might be said, "far may be sought erst ye can find, so courteous, so kind....."—S. Dillon Ripley

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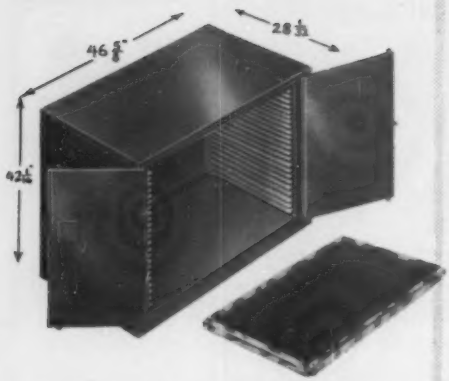

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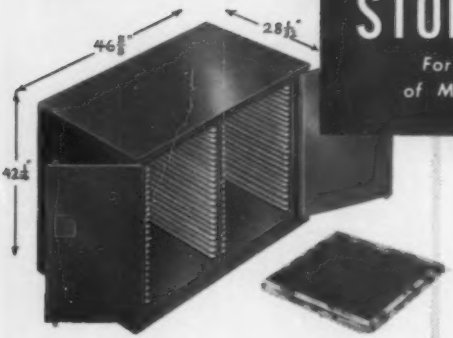

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